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Motor Industry as Whole Reaped Profit of 12.2 Per Cent in 1924

Ranks first among nation's major enterprises in prosperity. Steel companies earned only 7 per cent, banks 8.5 per cent and railroads 4.4 per cent. Statements analyzed.

By A. Motelle

SOME highly illuminating and equally gratifying facts concerning the financial condition of the motor industry are contained in the article presented here.

One of the things that will interest the men of the industry is the exceptional earning capacity revealed during a year of such vicissitudes as 1924.

The author is a well-known economist and analyst whose articles appear regularly in financial papers.

FEW people realize perhaps that even in 1924, which was a year of at least mild depression in the motor industry, the industry as a whole, judging by representative dividend paying companies, fared surprisingly well.

For instance, on the total capital invested in the industry, which includes the bonded debt, preferred stocks, common stocks and surplus (and in the capitalization good will is very liberally represented) the earnings were 12.2 per cent.

This means that on $1 of invested capital as carried on the books of the companies, 12.2 cents was net profit. This compares with around 7 cents earned on $1 of invested capital by representative steel companies, 4.4 cents by our railroads and around 8½ cents by banks.

Such a performance, in spite of highly competitive conditions, testifies to the fact that the automotive industry is easily one of the most prosperous in the nation.

This is not the only interesting thing about the automobile industry. It is, perhaps, not commonly realized that the industry has shown an ability of unusually rapid turnover of inventories and of net working capital. A rapid turnover of inventory and net working capital is a very profitable operation and requires able management and merchandising policies. It is profitable because inventories, consisting of raw materials, unsold goods, etc., moved slowly, reflect a slow turnover of business, and vice versa. The same holds good of net working capital, which is the difference between the total quick assets and quick liabilities of a company, and which constitutes its proper working funds. The more times these factors are turned over the more is multiplied the profit per unit of sales.

In 1924, in the automobile industry, the turnover of inventories, as measured by the ratio of total sales to total inventories, was 5.5 times, while the turnover of net working capital, as measured by the ratio of total sales to net working capital was 3.2 times, a highly satisfactory performance for an industry of this kind in a year like 1924.

The sales in 1924 amounted to 1.27 times the total amount of capital invested in the industry; i.e., for $1 of capital—bonds, stocks and surplus—sales were $1.27.

In the following analysis the combined accounts of eight dividend-paying motor companies—General Motors, Studebaker, Packard, Nash, Chandler, Hudson, Hupp and Jordan—will be considered in relation to the present combined market value of their common shares. The data used is from the companies' official reports.

The combined number of shares represented by this group of automobile companies is at present 12,286,579. The combined value of all these shares at the closing prices of May 6, 1925, was $701,600,000, which

works out at $57.10 per share. This means that if one is to buy stocks of the various eight companies in proportion to the number of stocks of each company, the average price paid, as of May 6, 1925, prices, would amount to $57.10 per share. This is a so-called weighted average against an ordinary average which is arrived at by adding up the prices of the eight respective shares of each company and dividing them by eight.

Of these eight companies, only four stated officially their production, or number of cars sold. The total cars produced by these four aggregated 821,385. The combined value of all the common stocks of these four companies, as of May 6, 1925, was $551,756,000, and the total number of shares of the same companies aggregated 7,628,559.

If we divide the total market value of the shares of the four companies by the number of shares, the average value per share works out $72.25, which is higher than the average for our eight companies. If we divide the total value of all the shares of these four companies by the total number of cars produced, something like $672 is obtained, which means that the average value of the common shares of these companies per car produced was around $672.

The per car figures are of only secondary value in view of the wide range of prices of cars sold by the companies. If, instead, we take the more comparable basis of sales, we find that seven companies were reporting total value of sales of $868,244,000. The aggregate value of all the common shares outstanding of these seven companies being $691,800,000, dividing the value of sales by the value of shares we obtain 1.25.

This means that investing $100 in common shares of these automobile companies, the buyer is obtaining $125 of sales power of these automobile companies on the basis of 1924 returns. To simplify it further, it means that the buyer of $100 of stocks of the seven companies secures for himself an equity in the total amount of the value of sales of these companies of $125. At present he really secures a considerably larger equity in such sales, as most probably 1925 sales will be higher than 1924.

The four companies reporting the output of cars also reported the total value of sales of $673,576,000. If this is divided by their total output of cars $782 is obtained, which means that the average wholesale price of their cars amounted to $782.

Of the eight companies, six reported the cost of sales, and these aggregated $701,879,000. The number of common shares of these companies totaled 11,773,579. If we divide the total cost of sales by the number of shares, we obtain $60 as the average cost of production and selling per one share common. These same companies reported the gross value of sales at $811,240,000, which, divided by the total number of shares, gives $69.10 per share. This means that in buying one average share an investor secures for himself, on the basis of 1924 returns, $69.10 of gross turnover of business against which his cost of manufacturing and conducting the business, also per share, would amount to $60. The difference between the two, namely, $9.10, is the gross profit which he could expect to obtain on his share.

Seven companies reported gross profits before other income, that is, before income not directly connected with automobile manufacturing. The gross profit from manufacturing amounted to $112,581,000, and if this is divided by the total number of common shares of these companies, amounting to 12,053,579, the per share gross profit works out at $9.30, which is a little more than the average profit per share on the six companies discussed above.

The six companies discussed above have reported $701,879,000 as their aggregate value of sales, that is, the amount realized from selling their output. They also reported a total profit of $109,360,000, the ratio of total expense to the gross value of sales thus working out some 84.4 per cent.

This means that on $1 realized by the six manufacturing companies for their cars, 84.4 cents was absorbed by all costs, leaving 15.6 cents as the gross margin of profit. This 15.6 cents of gross profit for every $1 of sales was responsible for $9.10 as the gross profit per share common. That is, in buying common shares of these companies, on one share the investor would secure for himself $9.10 as gross profit.

The average price of one common share of these six companies on May 6, 1925, amounted to $51.50, which means that by investing $51.50 and securing one share of these six companies, the investor would obtain a gross profit of $9.10, and if he would buy $100 worth of such shares, that is, something like 1.94 of such shares he would secure a gross profit of $17.60, always on the basis of 1924 business. The profit most probably will prove to be larger on the basis of 1925 business.

This is a rather high return and compares favorably with many other industries for the same period. However, this is only gross profit from which various deductions have to be made before the net income is arrived at. On the other side, in addition to this operating profit, there is a non-operating profit—one that is derived from operations not directly connected with the manufacturing of cars. Of the eight companies, five have reported such an outside income amounting for all the five companies to $3,632,000; the number of shares

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IT IS interesting to note that, while the profits of the average motor company are above the level of other major industries, these profits have been gained through able and efficient management and not at the expense of the public.

The public today pays 29 per cent *less* for automotive products than before the war. Commodities in general cost 67 per cent *more* than in pre-war days.

Among the factors which have enabled the automotive industry to maintain such satisfactory profits in the face of constantly descending car prices, increased cost of materials, higher labor costs and higher taxes, may be mentioned quick turnover of inventories and net working capital, the development and utilization of vastly improved production methods, highly perfected distributing organizations and the elimination of waste through simplification and standardization.

Referring to the elimination of waste alone, A. L. Horning, president of the Society of Automotive Engineers, stated recently that the average annual saving of the industry from this item approximated $312,000,000. And this, he added, just about represents the net earnings of the industry at the present time.

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of these five companies amounting to 6,765,979, the outside income per average share of the five companies thus working out at 54 cents. These five companies reported an operating profit, i.e., one derived from the manufacturing and selling of automobiles, of $39,079,000. Thus the net income not directly related with the chief business of the company amounted, for these five companies, to 9.2 per cent of the gross manufacturing profit. This means that to every $1 of gross profit derived from manufacturing, 9.2 cents was added for those companies as income from other sources.

The total gross income, including profit from non-manufacturing sources of seven companies amounted to $116,213,000, and their number of shares common 12,053,579, or $9.65 per share, dividing this income by the total number of shares of these companies. The average price of one share of these companies was $50.90 and the gross total of profit on the market price thus works out 19 per cent.

Interest Deductions

Only three companies reported interest deductions; that is, deductions from gross profit for paying interest on their bonds and notes. This, however, was an insignificant item, only $83,000—which shows that the industry is almost wholly financing itself with its own funds and is borrowing very little from the outside, in marked contrast with many relatively young industries whose earning power has not been sufficiently stabilized to command a ready market and a high credit for their bonds.

Depreciation, contingency and other reserve appropriations were separated by seven companies and they aggregated $30,239,000. They amounted to 27 per cent of the gross operating profits of the companies and represented a liberal allowance for the purposes when comparison is made with the steel and similar industries.

The net income after all deductions for the eight companies amounted to $84,894,000 or $6.84 per share common, which was equivalent to 12 per cent on the market value of the shares, at the May 6, 1925, price.

This means that in buying an average share of these eight companies at May 6, 1925, prices, one would secure a net income (before paying preferred dividend) of 12 per cent on the price paid for the share. This is a rather liberal return, although not so favorable as in the steel industry, for instance, where $16.70 of such income on $100 of investment could have been secured. But motors have made considerably more progress since 1924 than steel.

How Income Is Divided

However, not all of this income goes to the common stockholders. Preferred stockholders have received, out of the total income of $84,894,000, $10,195,000 for the five companies reporting payment of preferred dividends. The net income of these five companies amounted to $73,859,000, before preferred dividends. This means that the preferred stockholders of these five companies drew 13.8 cents as their share of $1 of total net income.

The net available for common for all the eight companies was $74,698,000. This is $6.08 per share or 10.6 per cent on an investment of $100, at May 6, 1925, prices. This is the total moneys left in the treasuries of the companies belonging to the common shareholders as all prior deductions and charges have been taken care of. This sum is a fairly large one and compares with only $10.28 as the earning equity of $100 invested in steel stocks on the same date.

Most probably on the basis of 1925 earnings, an investment in motor stocks at May, 1925, prices, will yield 12 per cent or more on account of larger business and larger earnings expected in the present year. Of the net amount of money earned by the common stockholder, a little less than 59 per cent was paid out in cash dividend and about 41 per cent placed in surplus—added to the capital already invested in the business. The moneys paid out in dividends, if divided by the total number of shares, gives $3.50, which means that the average stockholder of these eight companies received on each share $3.50 dividend. At the price on May 6, 1925, such a divi-

Financial Picture of Motor Industry for 1924

(As Shown by Analysis of Representative Companies)

	No. of Companies	Dollars	Per Cent
Average value of shares May 6, 1925	8	57.60	
Market value of all shares common, per car produced	4	672.00	
Average value of shares of these companies	4	72.25	
Sales per $1 of market price of shares	7	1.25	
Average sale price per car	4	782.00	
Cost of sales per share (companies reporting production of cars)	4	60.00	
Sales value, per share	6	69.10	
Gross profit, per share	6	9.10	
Gross Profit, per share	7	9.30	
Ratio of expense to value of sales	6		84.7
Ratio of expense to value of sales	7		86.5
Per cent of gross earnings on market price	6		17.6
Net income per share	8	6.84	12.0
Net income per share	7	9.65	19.0
Net available for common	8	6.60	
Per cent of net on market price	8		10.6
Common dividend per share	8	3.56	
Yield on market price	8	6.21	
Net working capital, per share	8	22.10	
Turnover of inventories	8		5.50
Turnover of net working capital	8		3.20
Gross book value, per share	4	74.4	
Valuation of Good Will	4	6.2	
Net income on invested capital	8		12.2
Sales per $1 of invested capital including reserves	7	1.11	
Sales per $1 of invested capital excluding reserves	7	1.27	

dend would yield 6.21 per cent against only slightly above 6 per cent for representaive steel stocks. The dividends of these eight companies are at present higher than they were on the average in 1924. On the basis of present dividends, the average stockholder obtains some $4.05 per share and an average yield of $7.10, always on the basis of the cost of such shares on May 6, 1925.

The consolidated balance sheet of the companies shows that the total value of plant and investment, in which are included good will, patents, etc., when divided by the total number of shares is $36.40, which is about one-fifth of the fixed capital of average steel industries.

It is, of course, realized that the less money tied up in fixed capital, the better it is for the industry.

Current assets amounted to $29.10 per share and in these assets cash was represented by $10.30 and inventories by $12.08 per share.

Strong Current Position

On the other side of the balance sheet, current liabilities stood at $7. This shows a strong current position, where current assets are over four times as large as current liabilities and where the excess of current liabilities amounted to $22.10 per share. The preferred capital amounted to $11.70 per share common. This means that, with the current assets, all the current liabilities and preferred capital could be paid off and still leave $10.40 in the form of liquid assets belonging, after the deduction for the small fixed debt, to the stockholders. This is a remarkably strong financial position of which not many industries can boast.

The value of the common stock as given to it in the books of the companies averages $32 per share; in addition to that, the surplus, consisting of previous earnings accumulated and not disbursed, amounted to $12, making $44 as the approximate total value of the equity of the common stockholder back of one common share.

In addition to that, the companies carried an aggregate value of reserves which on a per share basis amounted to $8.80, making the gross total of the equity of a common stock inclusive of reserves $52.80. This means that, according to the eight companies' books, there are values back of one share which was selling in May at $62.16 of $52.80. Four companies specified the good will account. Their average book-value per share was $74.40, of which $6.20 was good will. The average percentage of good will to tangible assets is a little over 10 per cent.

What the Values Include

These book values include both tangible items, such as plant, machinery, working capital, etc., without deductions for reserves, and also in tangible items such as good will and patents. What the real value of this equity is, i.e., for what it would be possible to sell the plant, machinery, etc., there is, of course, no way of knowing. But in view of the established earning power of the industry, this question is only of remote importance as long as the industry continues to show a strong earning power, even under adverse conditions.

It is not the tools alone that produce earning power, but the industrial organization built up around the tools.

It is the earning power of the industry that is of almost exclusive importance as a determinant of the investment value of the industry as a whole, or of only one marketable unit—one share.

Although present stock prices have discounted to a large extent this earning power, unquestionably the industry is one of the most profitable in America, the general talk about the small margin of profit notwithstanding. It is the realization of this fact that has been responsible for the activity in motor shares at rising prices, which, though perhaps overdone in certain individual instances, on the whole reflects the present strong position of the industry.

Materials for Fuel Tanks

TESTS to determine the resistance of various sheet metals to the action of different motor fuels have been made by Professor Wawrziniok of the Dresden Technical College. Under the new German motor vehicle law the fuel tanks must be made of tenacious sheet which is non-corrodible and, as a large variety of different motor fuels are used in Germany, this requirement of non-corrodibility seems to require investigation. The materials tested included the following: Bright sheet steel, blued sheet steel, standard white sheet steel, lead coated sheet steel, zinc covered sheet steel, tinned sheet steel, copper coated sheet steel, sheet copper with rolling skin, sheet brass with rolling skin, sheet aluminum.

The fuels to which the test pieces were exposed included motor benzol, tetralin, gas oil, solar oil, blue oil, yellow oil, mixture of 70 per cent benzol and 30 per cent 96 deg. alcohol, mixture of 50 per cent benzol, 25 per cent alcohol and 25 per cent tetralin, and eight other fuels bought in the open market and the nature of which was unknown. The results of the tests were as follows:

1. Bright sheet steel was slightly attacked by some of the unknown fuels and more severely by the fuels containing 96 per cent alcohol, so that a rust coating was formed.

2. Blued sheet steel was attacked by the fuels containing alcohol so that a coating of rust was formed on the surface. A stronger formation of rust was shown by the bright sections of the sheet metal.

3. White sheet steel was attacked on the surface only by two of the unknown fuels. At the sections a light deposit of rust was produced by these as well as by the fuels containing alcohol.

4. Lead coated sheet steel was attacked more or less on the surfaces by all of the fuels, more particularly by the gas oil and the benzol-alcohol-tetralin mixture.

5. Zinc coated sheet steel was attacked by most of the fuels with the exception of motor benzol, most strongly by gas oil and the bonzol-alcohol mixture. Deposits of metallic salts were formed in the liquids.

6. Tinned sheet steel was not noticeably attacked by any of the fluids.

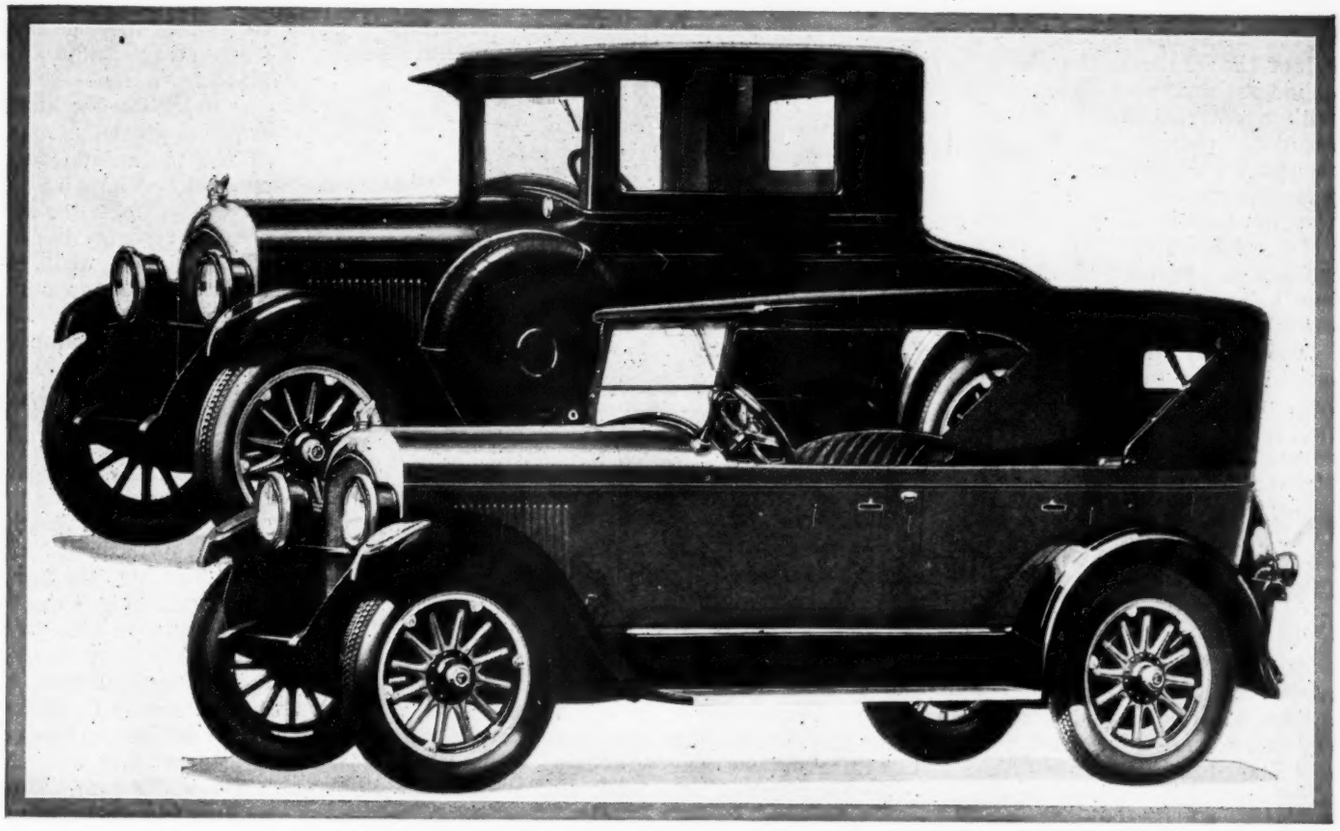
7. Copper plated sheet steel was slightly attacked by one of the unknown fuels and more strongly by another, so that deposits of metallic salts were formed in these fluids. Yellow oil and the two fuels containing alcohol also attacked the material and formed deposits.

8. Sheet copper with rolling skin was attacked more or less by most of the liquids and most of all by the two fuels containing an alcohol admixture. After a short time different colored deposits were observable in the liquids.

9. Sheet brass with rolling skin showed the same properties as sheet copper.

10. Sheet aluminum was attacked most by the fuels containing alcohol.

The above results show that all metals with the exception of tin are subject to attack by one or more of the fuels, and it is therefore advisable to give fuel tanks a coating of tin on the inside after completion. Such tanks can then be used for all the different fuels marketed without incurring any risk of injury from rust formation on the inside.



The Chrysler Four coupe and the touring car

Distinctive Lines of Chrysler Six Carried Out in New "4"

New cars look like the six-cylinder models. Engine having S. A. E. rating of 21.03 hp. is fitted to 109 in. wheelbase chassis. Hydraulic four-wheel brakes optional. Balloon Tires

By Leslie S. Gillette

THE new Chrysler Four, which was first announced in AUTOMOTIVE INDUSTRIES on June 18 and described briefly in the news columns o fthe issue of June 25, is almost an exact duplicate of the six-cylinder Chrysler in external appearance. Radiator design, body style and color scheme are practically identical.

Extreme ruggedness is claimed for the 109-in. wheelbase chassis, which follows conventional practice, employing a four cylinder 3⅝ in. by 4½ in. L-head engine, developing 38.5 b.hp. and having a S.A.E. rating of 21.03 hp., with single dry plate clutch, three speed selective transmission, semi-floating rear axle, half-elliptic springs and artillery wheels mounting 30 by 5.25 balloon tires for all models except the sedan, which carries 30 by 5.77 balloons.

Lockheed-Chrysler four-wheel brakes are offered on all models at additional cost, this being the first time that any car in the Chrysler Four price class has made hydraulic four-wheel brakes optional equipment.

Through special study given to the designing and manufacturing, it is claimed the powerplant of the new model is one of the smoothest operating four cylinder engines now fitted in automobiles. Vibration, it is said, has virtually been eliminated from the powerplant itself by placing all rotating parts of the engine and clutch in static and dynamic balance by matching all piston and connecting rod units to within one hundredth part of an ounce before assembly, and by the employing of large bearings and an unusually heavy crankshaft.

As a further insurance against engine vibration in the chassis frame, a semi-elliptic spring mounting, consisting of fourteen leaves, is used in place of the usual bolts to fasten the motor to the frame. At the rear, the engine is supported from the frame by live rubber bushings through which pass the hold down bolts, preventing thereby metal contact between the powerplant and the chassis and at the same time providing a cushioning effect for the entire unit.

Four Models, Price Range $895 to $1095

THE new Chrysler Four line consists of one open and three closed models, the touring car listing at $895, the coupe at $995, the coach at $1045 and the sedan at $1095.

All models are finished in two-tone Duco. The closed bodies are built by Fisher and are equipped with one-piece vision ventilating windshields.

All models have nickel radiator shells with ornamental cap, automatic windshield wipers, rear traffic signals and gearset locks.

The three closed models have cowl lights, sun visors, rear view mirrors and door locks. Both coach and sedan are equipped with engine heat indicators and the latter model has a heater.

Cast in block and integral with the upper half of the crankcase, the cylinders are provided with a detachable head secured in place by fourteen studs, while the oil pan or lower section of the crankcase is of pressed steel carrying at its lowest point a combined oil strainer and drain plug.

The crankcase is machined from a one piece heat treated, drop forging and is mounted in three babbit bearings, the dimensions of each being, front 1⅞ in. dia. by 2 13/32 in. length, center, 2¼ by 1¾ and rear, 1⅞ by 2 13/16.

The connecting rods which also are drop forgings, heat treated, have a center to center length of 7⅞ in. and a bearing dimension of 1⅞ in. dia. and a length of 1½ in. At the upper ends of the rods, hardened alloy steel pins of ¾ in. dia. and 3 in. length oscillate in the aluminum alloy pistons, which are of the bridge type and slotted skirt design to allow for even expansion and contraction. Three rings, ⅛ in. by 9/16 in., mounted above the pin are employed, the bottom ring being of a special oil controlling type to prevent pumping and excessive carbon formation.

Engine lubrication is by a full force speed system to all main and connecting rod bearings, with positive oiling of the cylnder walls and piston pins. A stream of oil from the front main bearing lubricates the gears in the timing gear case.

A new feature of the engine is the method of lubricating the cylinder walls and piston pins. A hole which is drilled clear through the web of the connecting rod and bearing on the left hand side, when viewed from the front, registers at a certain period with the oil hole on the crankpin for lubricating the big end of the rod. It is so timed that when the two holes are in line a stream of oil is spurted out by the oil pressure in the crankshaft and thereby lubricates the piston pins and also the cylinder walls.

In operation, oil passes through the strainer located in the one gallon reservoir forming oil pan and is drawn up into the pump, which is connected with a spiral gear integral with the camshaft. From the pump, the oil goes to the distributor bolted to the center main bearing cap and from there is conducted to the front and rear bearings by tubes. Passing through ¼ in. passages drilled in the crankshaft, the oil is then forced to the crankpins and from there lubricates the cylinder walls and piston pins as already described. The "Oil-Vac" system which automatically shuts off the fuel supply when trouble develops in the oiling circulation is incorporated in the oil pump and mounted on the right side of the crankcase.

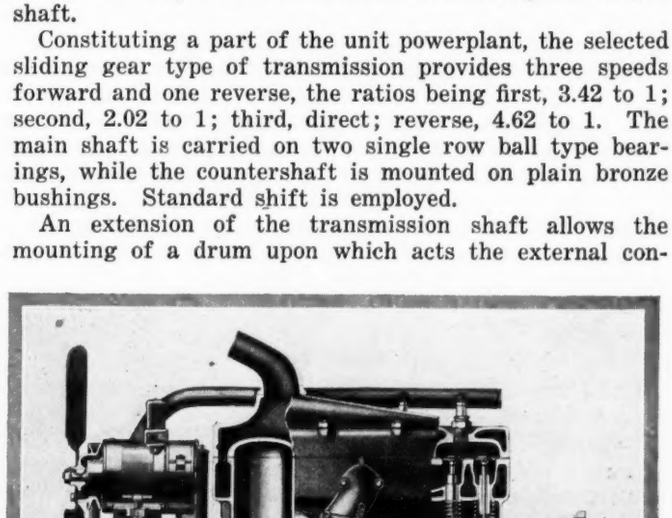
The thermo-syphon type of circulation is employed in the cooling system, which has a water capacity of 3¼ gallons. Air is drawn through the 96 unit tubular radiator by a 17-in. two-bladed fan carried at the end of the generator armature shaft and driven together with the generator at twice engine speed by a "V" type moulded belt. Mounted on a cradle bolted to the top of the gear case cover, the generator is held in place by a steel strap while the starter, which is engaged by Bendix drive, is placed on the left side of the motor and fastened by three cap screws. Semi-automatic battery type ignition is employed, the distributor and coil being mounted at the front of the engine on the gear case cover. The electrical equipment is of Remy manufacture with the exception of the battery, which is 6-8 volt "bone-dry" Willard.

A vacuum tank mounted on the dash delivers fuel from the 11 gallon capacity tank suspended at the rear to a Stewart 1 in. carbureter located on the right side of the motor. The vertical type of carbureter is bolted to the combined intake and exhaust manifold and has the air intake connected to the rear of the manifold by a hot air pipe.

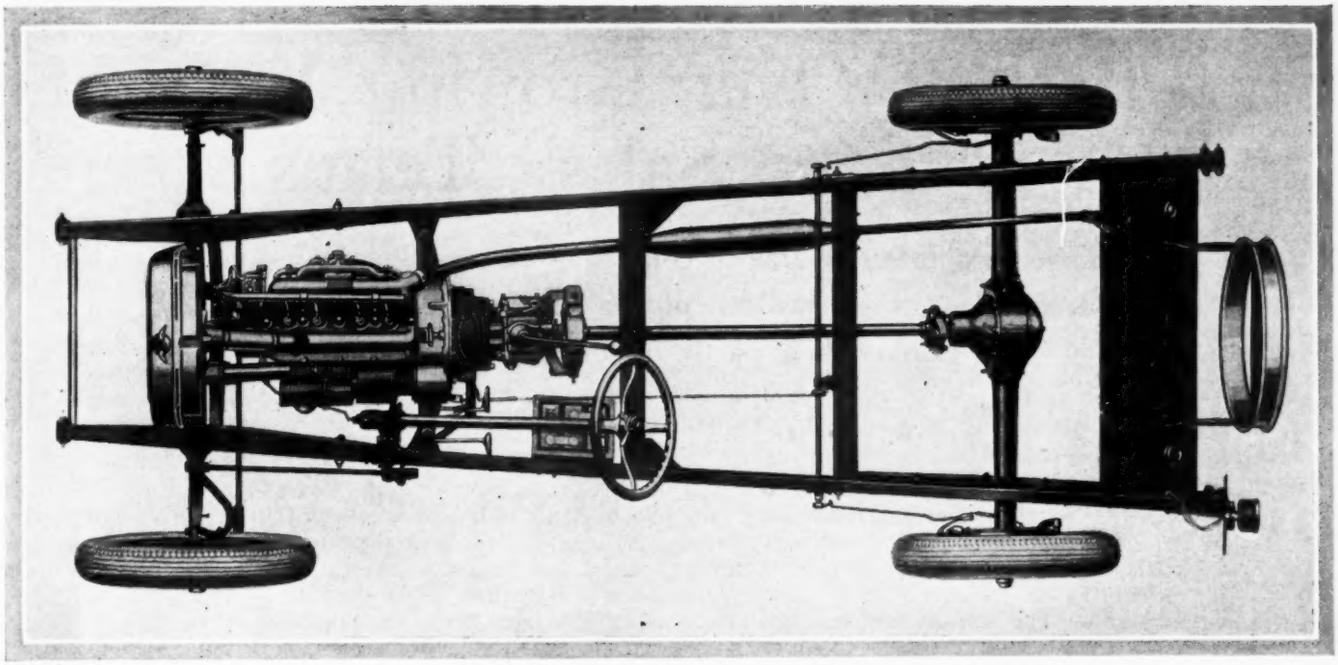
Between the engine and the gear set, a single dry plate clutch consisting of a pressure plate assembly of nine springs and three release arms providing compound leverage is employed. Knurled nut adjustments, spring locked, are provided on the three levers which govern the pressure applied to the woven asbestos cord facings. The throw out bearing is automatically lubricated from the transmission by means of a hole drilled through the clutch shaft.

Constituting a part of the unit powerplant, the selected sliding gear type of transmission provides three speeds forward and one reverse, the ratios being first, 3.42 to 1; second, 2.02 to 1; third, direct; reverse, 4.62 to 1. The main shaft is carried on two single row ball type bearings, while the countershaft is mounted on plain bronze bushings. Standard shift is employed.

An extension of the transmission shaft allows the mounting of a drum upon which acts the external con-



Partially sectioned view of Chrysler Four engine



Bird's eye of Chrysler Four chassis

tracting type emergency brake, the diameter of the drum being 7 in. and the width 2 in. Drive to the axle is through a seamless steel tubing propeller shaft of 1¾ in. dia. and by three disk, rubber-fabric universal joints at either end of the shaft.

Drive and torque of the semi-floating rear axle is taken through the springs which are mounted below the pressed steel housing. Spiral bevel gears of chrome nickel steel provide a standard ratio of 4.60 to 1 for all models. The pinion shaft, which is integral with the smaller gear, is carried on a double row annular ball bearing at the forward end and on a single row bearing of similar construction at the rear. The differential is secured by tapered roller bearings.

Bearings and Gears Accessible

Annular ball bearings at the wheel end of the 1 9/16 in. max. dia. chrome nickel steel axle shafts take the end thrust as well as carry the weight of the car. Inspection of the bearings and gears can be made by removing the large housing cover, while the differential carrier itself is removable as a unit. On the two-wheel brake models the external contracting bands are divided into two pairs and through a toggle and spring arrangement allow gradual wrapping of the bands about the drums, the latter being 12 9/16 in. dia and 1½ in wide. The standard Lockheed self-equalizing action is used when four-wheel brakes are installed.

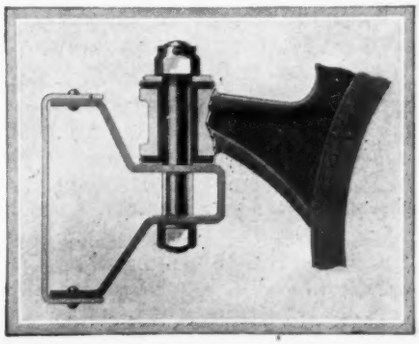
Front axles are mounted beneath the springs and are of "I" beam section having heavy drop forged steering arms and knuckles. Ball thrust bearings at the knuckle heads, bronze pivot pin bushings and tapered roller wheel bearings are common to each axle. Heavier construction to withstand the torque of the front wheel braking effect and the king pins set at an appreciable angle from the vertical plane characterize the four-wheel brake axles.

The steering gear, of the design known as the semi-reversible worm and sector type, has been specially developed for low pressure tires. Thrust is taken by ball bearings mounted on either side of the hardened steel worm while the shaft proper is carried in phosphor bronze bushing having spiral oil holes for proper lubrication. At the center of the 17 in. dia. steering wheel is the button connected with a motor driven horn, together with short type levers operating the spark and throttle controls.

Semi-elliptic springs are used all round, the dimensions of those at the front being 36 in. long by 2 in. wide and provided with ⅝ in. shackle bolts, while at the rear the shackle bolts are ¾ in. dia. and the dimension of the springs 53 in. long by 2 in. wide. Exclusive of the front tubular brace and the rear engine support, four heavy gauge cross members are employed in building the frame, which is of pressed steel having a channel section 6 in. deep by ⅛ in. thick and kicked up over the rear axle.

On all bodies a line of beading extending all the way around from the radiator provides a double belt effect adding greatly to the symmetry of the coach work, which consists of pressed steel panels mounted over an ash framework.

The touring car is upholstered in hand crushed dual tone Spanish leather that harmonizes with the beige brown exterior finish and the black top.



Insulation of live rubber in rear motor support. This, combined with a spring suspension in front, is claimed to make the Chrysler Four motor virtually vibrationless

The 75 mile speedometer, oil gauge, ammeter, dash light, carbureter control and the rotary one lever type of switch, controlling all light combinations, are mounted in an oval panel in the center of a metal dash. Twenty-one candle-power, single contact bulbs are used in drum style headlights which are of the dimmer type and fitted with anti-glare reflectors. Cowl lights of 4 cp. are furnished on all models while the dome, tail, signal and dash lights are fitted with 2 cp. bulbs. Natural wood wheels having 1⅜ in. spokes are standard equipment on all models.

Concern Felt Over Growing Liberality of "Time Sales" Terms

Competition between finance companies is resulting in use of credit plans which may have unpleasant after-effect on industry. Bankers held partly responsible for situation.

By Norman G. Shidle

SOME of the methods being used in financing retail automobile sales today are viewed with very real concern by important finance company executives, as well as by men in other branches of the industry who see the possibility of ill effects, not only on the financial organizations but on dealers and manufacturers as well.

Some finance men, on the other hand, see the present long terms and keen competition merely as a passing phase of the situation which will last only until those companies operating on a "wildcat" basis pass out of the picture.

Despite efforts on the part of many finance companies to stabilize at reasonable levels, down-payments and installment terms by means of cooperative effort through a national finance company association, conditions have caused apprehension in some parts of the country in recent months. Notes running 14 and 18 months have become common in many places, while down-payment of 30 and even 25 per cent are not at all uncommon.

The danger is not so much in the extension of longer terms as in the acceptance of smaller down-payments, although as a rule the transaction should not be allowed to run more than 12 months. This is pretty generally agreed upon by all finance company men, whatever their differences may be on other matters. The intensity of competition, however, has forced many finance companies to extend terms temporarily which they do not believe to be in line with sound business practice.

Down Payments Get Smaller

The recent announcement of several new financing plans, some local and others national in scope, which involve either very low down-payments or exceptionally low financing charges, has aroused the fear that further unsound practices may become common in an attempt to meet the new competition. Not only has the Ford $12.50 plan been extended to a number of cities, but dealers for other cars have obtained somewhat similar financing arrangements in a few local areas. The dealer for one make of car in a southern city is said to have completed arrangements with a local financing company which permits one-third down-payment and 12 months to pay at a rate of 8 per cent on the unpaid balance, including insurance. This is offered on a non-recourse basis and the financing company will accept *all* of the paper offered.

In one city it is reported that the dealer for a $1,000 car is advertising "Any car delivered for the small sum of $12.60—less than the price of four seats for the theater," while another is requiring only a $70 down-payment on a $1,300 car.

For several years a large portion of the financing of automobiles on the Pacific Coast has been upon terms of 18 monthly payments instead of 12.

The experience of the most reputable finance companies has tended to show that a certain proportion of paper maturing in more than a year can be safely handled. But the essential thing in automobile financing is to obtain the maximum initial payment. It is less sound to sell a car with 10 per cent down and the balance payable in three months than with one-third down and the balance in 12 or more months.

Ford Plan Criticized

Herein lies the most acute criticism leveled against the new Ford plan by financing experts. At no time during the early months of the operation of the plan is the financing company protected—the payments do not equal the difference between the original price and the resale value of the used car. In regard to other points in the Ford plan, A. E. Duncan, chairman of the Board, Commercial Credit Co., in a recent talk before the Association of Reserve City Bankers, said:

"The expense of investigating the credit of three people for each transaction and then of possibly turning down three or four transactions out of five will be very great and the finance charge very high. The average buyer of a low priced car on time is already a poor credit risk, much worse today than two or three years ago, and getting worse all the time. Three such names are but little better than one.

"The maker and two co-makers on such transactions will usually be execution proof, of poor credit standing, many of them rather ignorant as to business custom, and I think much collection trouble will be encountered and a big increase in the number of repossessed cars will be shown, which may react upon the used car market."

Accusations and counter-accusations among finance companies, as regards "balloon" notes brought about a meeting in one city recently at which all companies agreed to live up to certain principles of financing somewhat similar to those laid down in the resolutions adopted a year ago by the National Association of Finance Companies in Chicago. Some question still seems to exist, however, as to whether or not the agreement will be lived up to by all concerned.

These conditions are of direct practical interest to the car manufacturer. They are not merely academic facts that can be viewed without serious concern. It is essential that automobile dealers have adequate and proper financing facilities available if the manufacturers are to be able to keep on turning out cars in quantity and having them sold on a time payment basis. So long as such financing is profitable, desirable capital will be

available for the purpose. When it becomes profitless, good capital will seek other fields. The prosperity of the dealer over a long period of time also requires the use of sound as well as of a sufficient quantity of financing.

It is important, moreover, that automobiles be put into the hands of owners at the lowest possible actual cost. This is possible only when financing is on a sound, economical basis.

Finance companies today are operating under competitive conditions which make necessary strenuous sales efforts and which resulted in maximum offers in the way of free service and terms to dealers. The struggle for business among finance companies is so keen that even some of the stronger organizations find it necessary to grant terms which are not in accord with sound economics in order to meet competition offered in local areas.

The fact that wildcat operators finally go out of business doesn't help the present situation to any great extent. While the unstable companies are in the process of disintegration they are offering terms and service which naturally attract the dealer because of their liberality, and the entire financing structure becomes involved.

The Chicago meeting last year, which resulted in the formation of the National Association of Finance Companies, was a definite step in the direction of stabilization.

Sound Principles Formulated

That meeting, as is generally known, set up certain principles, chief of which was that the terms for financing passenger cars be kept within one-third minimum down payment as to new and 40 per cent as to used cars, the balance in a maximum of twelve equal monthly installments.

Undoubtedly much good has been accomplished by the statement of principles agreed upon and by the efforts made to live up to those principles. It is generally recognized, however, that the effort has been far from 100 per cent successful. Some national finance companies which have lived up to the provisions in general have had to violate them in certain areas to meet local competition. But the principles still stand and form a basis for future constructive effort.

The banks as well as the finance companies are responsible for the situation which now exists, because they have, in many cases, given full support to finance companies operating without any pledge or any idea of living up to the principles set up by those finance organizations which met in Chicago.

Again quoting Mr. Duncan in his talk before the Reserve City Bankers:

"Unfortunately there have been just enough finance companies as well as bankers in many sections who were unwilling to conform strictly to the Chicago resolutions and who thereby gained a temporary advantage over those who were doing so, to upset just recently the program entirely. When finance companies find that they must sink or swim together it is hoped that they will then generally unite upon a definite program for the good of all concerned. Meanwhile association companies must continue to meet substantial competition within reason, both as to down payments and as to 14, 16 and 18 months' paper.

"Many bankers have done their part toward upsetting the program by continuing to discount or accept as collateral loans retail paper direct from their automobile dealer customers which did not conform to the Chicago resolutions and thereby have compelled competitive automobile dealers to insist upon such service from their finance company connection."

In this period of intense competition among stable companies and of fighting for existence by less sound organizations, a good deal of waste inevitably creeps into the operations. It is through the efforts of stable finance companies to eliminate these inefficiences that any permanent cut in rates seems most likely to come. The opinion of another important finance company executive is interesting in this connection. He says:

"Delivery at Lowest Cost"

"The aim of every car manufacturer today is to get his product into the owner's hands at the lowest possible price. That doesn't mean just the factory list; it means the lowest ultimate price to the car buyer. The factory designers and production men have done their part. It's become bromidic to say that future cost reductions must come from elimination of waste and inefficiences in the distribution of the product. But—bromidic or not—it's true. And financing of times sales is a big part of distribution. The finance company benefits itself most by trying to achieve the ideal of the manufacturer, namely, minimum distribution cost to the ultimate consumer.

"One of the ways to reduce financing costs—and all other merchandising expense for that matter—is to build up dealers to be capable of assuming a greater degree of individual responsibility. Dealer helps are all right, but the ideal is a dealer who doesn't need bolstering up from finance companies or from factories. The dealer must be made to see that all these problems of financing as well as merchandising are his own personal business problems. He mustn't be allowed to feel that by hooking up with a finance company which offers him a lot of free service and takes a lot of responsibilities for him that he can forget credit and time sales problems. The more he forgets them the greater risk either he or his customers become for the finance companies with whom he is dealing—and, consequently, the higher financing charges must be to cover possible loss.

"Building individual responsibility among dealers will help cut financing costs as much as any other single thing I can think of."

Intensity of competition in one way, of course, tends to lower rates, because companies struggling for business are tempted to offer lower rates and longer terms in an effort to increase their volume. The effect of this factor on permanent rates, however, is likely to be bullish rather than the opposite, because of the other troubles generated by attempting to do business on too small a margin.

Large Scale Financing Grows

Large scale organization of automobile financing is another factor which has a tendency to lower rates. As in any business, large volume gives the opportunity for low overhead cost. With several large car companies either operating or directly supporting finance companies which will function for their dealers throughout the country, many of the economies possible from large scale organization already are accruing to automobile financing.

Longer experience on the part of finance companies in general, aside from their broadening operation, will have a tendency to increase efficiency of operation and to permit lower charges. Actual records of past performance will enable finance companies to figure more closely the margin upon which they can operate with safety as well as to revise practices and policies to meet more fully the requirements of the situation.

The drive for lower insurance rates also will affect slightly the cost of financing cars, although the chief benefits of low insurance rates will be in the direct saving to the purchaser.

All these factors are favorable to ultimate reduction of financing charges and to delivery of the car to its owner at minimum cost in the future.

The effect of financing methods on the prosperity of dealer organizations should not be overlooked by car manufacturers. The problem a few years ago was for the dealer to get financing accommodations sufficient to take care of his volume. Today in many cases the difficulty is for the dealer to choose from the plans offered to him the one that is best suited to help him increase his net profits.

Easiest Way May Be Hardest

Dealers, like manufacturers, are very human. They have strong tendency to take what looks like the easiest way even when they can't see to the end of the road. The finance company offering the easiest terms and taking away from the dealer the greatest load of responsibility has a running start when it comes to getting the business. But the keen dealer will look ahead of the immediate financial arrangements—and the factory should help less keen retailers to see the question in its broader aspects.

Long terms and small down payments may help a dealer materially to move cars from his floor when sales are hard to make. They may seem to offer a long-sought way out of a difficult merchandising jam. But when a lot of those cars begin to be repossessed, the dealer suddenly finds himself in hot water again, whether he is responsible for the resale of the repossessed cars or not. If he has indorsed the paper he has to sell the cars all over again; if he hasn't he may find his local market demoralized by sales made at cut rates by the finance company which made the repossessions. Either way, unsound financing practices come home to roost with the dealer and feed off of his net profits.

Finance Safety Education Needed

The stable finance companies are doing their part in educational work along these lines. They are helping dealers to a better understanding of proper business principles at the same time that they are trying to stabilize conditions for their own benefit. But a lot more educational work remains to be done. The trade papers are helping materially already and the car manufacturers will be found talking more about the subject in the future than they have in the past.

The practice of holding production carefully in line with retail sales has relieved the pressure on dealers to move cars at any cost and consequently has helped to make possible sounder financing methods. A continuance of this policy is almost certain by a large majority of car builders; this fact alone bodes well for the future.

The car manufacturer, the dealer and the soundly organized finance company have the same ends to achieve, that of maintaining correct economic practices in automobile financing. The forces for economic progress have had much the better of the fight so far. By continuance of work along constructive educational lines, the chief evils of the present situation may be eliminated before many years have passed.

New Gramm-Kincaid Trucks Made in Three Wheelbases

IN a recent issue of AUTOMOTIVE INDUSTRIES, containing an account of the last meeting of the Motor Truck Industries, Inc., at Plainfield, N. J., the business connection of B. A. Gramm, secretary and treasurer of the organization, was given as the Gramm-Bernstein Truck Co., Lima, Ohio. Some time ago, however, Mr. Gramm withdrew his interests from this firm and since January 1st of this year has headed another company which he organized as Gramm & Kincaid Motors, Inc.

This company, like is predecessor, is located at Lima and is building a special line of four and six cylinder, 2 and 2½ ton trucks in three wheelbase sizes. Continental motors are used, the four cylinder models having 4 in. bore and 5 in. stroke and developing 45 hp. at 2000 r.p.m. Six cylinder models use a 3⅜ in. by 4½ in. series N motor. All have removable heads, forced feed pressure oiling, and mechanically driven pump. Unit power plant, three point suspension with cushioned support and recoil spring check are used.

Multiple dry disk clutch, gravity fuel feed, and Ross steering gear are used on all models. Three speed transmission is used on the 2 ton and four speeds on the 2½ ton models. Disk wheels, with steel spoke optional, mounting 32 in. by 6 in. pneumatic tires are furnished with the smaller truck. Steel spoke wheels mounting 36 in. by 5 in. cushion tires front and 36 in. by 7 in. solids on the rear are used with the larger model.

Both sizes are furnished in 133 in., 150 in. or 164 wheelbase. Chassis weight of the smaller truck is 3350 lb. and of the other 3850 lb. Standard equipment includes extra rim, Alemite grease gun, set of tools, jack, and hand tire pump. The springs are compound compensating, semi-elliptic type developed by Gramm and Kincaid.

A NEW welding generator which delivers both direct and alternating current has been brought out by the Electric Arc Cutting & Welding Co., Newark, N. J.

Spot or tack welding, semi-arc, nickel-flash welding of thin cast iron, general cast iron and malleable iron work are best done with alternating current, and provision is therefore made for such welding. Welders who prefer direct current may have the full capacity in this current also. The same winding of the armature serves for both, so that no extra space is required. The only extra parts are two collector rings for the alternating current supply.

The main feature about the generator is that either the alternating current or direct current leads can be short circuited right at the collector rings or commutator without injury; the generator voltage simply dies to a value that holds the current constant and no injury is done to the generator while in this condition. Immediately the circuit is opened, the voltage returns to normal.

The generator is ball-bearing and has a power take-off at both ends for driving an air compressor and other machines. It can be driven direct or by belt or chain, requiring a maximum of 7 hp.

Diana "8" Engine Develops 72 hp.; Speed 77 M.P.H.

Powerplant built by Continental to Moon design. Wheelbase 126 in. and heaviest model weighs only about 3260 lb.

By B. M. Ikert

ANOTHER new name has appeared in the automotive field with the introduction by the Moon Motor Car Co. of the Diana Light Straight Eight, some of the features of which were described in the news section of last week's issue.

The engine of the Diana is built to Moon design by Continental and has a 3 in. bore and 4¼ in. stroke, giving a total piston displacement of 240.3 cu. in. The maximum torque at 1200 r.p.m. is 153 ft. lb. The clearance volume is 21.44 per cent and the compression ratio 4.66 to 1. Cylinders are gray iron of the L head type cast in block with the upper half of the crankcase. The head is detachable and the parting line of the crankcase is below the center line of the crankshaft, affording a rigid structure.

The crankshaft has five bearings, Nos. 1, 2, 3 and 4 being 2⅛ in. dia. by 1½ in. in length and No. 5 2⅛ in. dia. by 2 15/16 in. in length. The bearing in the caps is babbitt, and bronze backed bearings are used in the upper half of the main bearings. The firing order is 1, 6, 2, 5, 8, 3, 7, 4.

Pistons are of gray cast iron fitted in the cylinders to 0.003 and 0.002 in. tolerances. The overall length of the piston is 3½ in. and there are three 3/16 in. rings above the wrist pin, the lower ring being a Perfect Circle. The piston pins are tubular steel type, 55/64 in. in diameter, hardened, burnished and locked in the piston. A bronze bushing is used in the upper end of the connecting rod and this bushing is 1⅛ in. long.

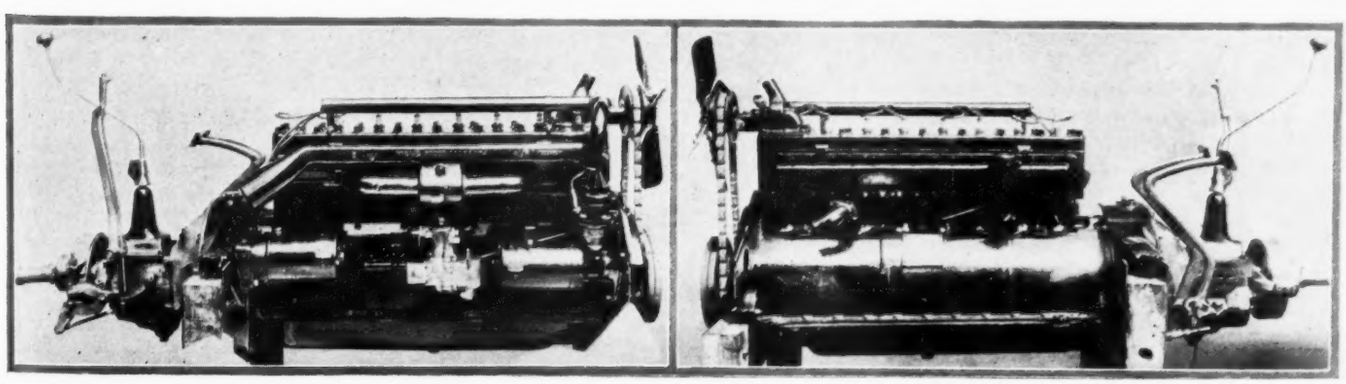
Connecting rods measure 9 in. center to center. The babbitt is spun into the big end of the rod, which bearing is 2⅛ in. dia. by 1¼ in. in length. The bearing cap bolts are chrome nickel steel, 7/16 in. dia.

The valves are placed on the right side of the engine and are made of Ascoloy alloy steel. Intake valves are 1 7/16 in. dia., while the exhaust valves have a diameter of 1 5/16 in. Valve stems are ⅜ in. dia. and the valves have a lift of 5/16 in. The springs are 1 5/16 in. dia., made of electric furnace vanadium steel. The springs seat the valves with a pressure of about 60 to 65 lb.

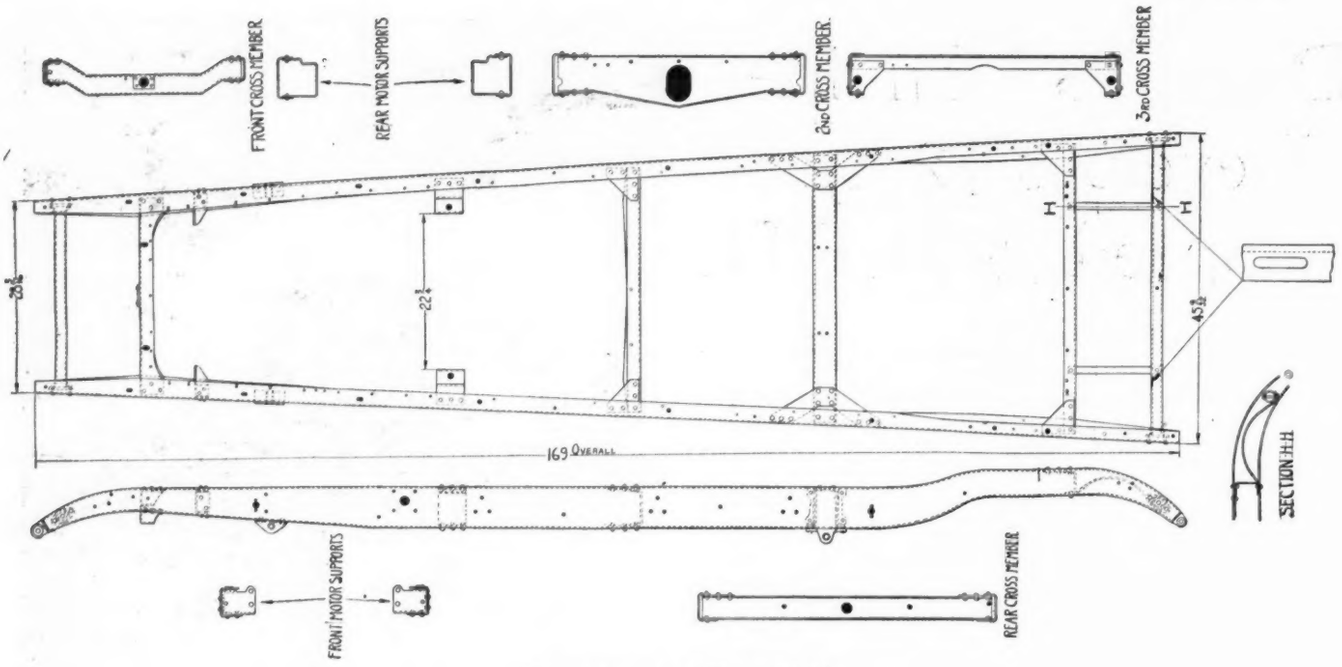
The camshaft has five bronze backed bearings, as follows:

	1	2	3	4	5
Diameter ..	2 1/16	2	1 15/16	1⅞	1½
Length	1 5/16	⅞	⅞	⅞	1¾

The diameter of the shaft between bearings is 1⅛ in. Tappets are of the mushroom type. The camshaft is driven at the front end of the engine by a Morse silent chain 1¼ in. wide and ⅜ in. pitch with 76 links. A more or less conventional oiling system is used, consisting of pressure feed to all main and camshaft bearings and spray lubrication to piston pins. A gear pump is accessibly located on the right hand side of the crankcase. Cooling



Right and left side view of the Diana straight eight-in-line engine showing manifolding and mounting of auxiliary equipment



Frame layout of Diana Eight

is taken care of by a centrifugal pump located on the front end of the cylinder head. A McCord cellular type of radiator is used with a manually operated shutter. The fan belt is a Graton & Knight V-type.

The wheelbase is 126 in. and 32 by 6 in. tires are mounted.

Other equipment includes Stromberg 1¼ in. carbureter of the cross throttle vertical outlet type; Delco two-unit electrical system; Borg & Beck clutch in unit with Warner T 64-J three-speed gearset; Salisbury axles front and rear; Mechanic drive shaft and universal joints; Lockheed hydraulic brakes; a Lanchester vibration dampener at front of engine; Alemite chassis lubrication system.

Bodies Like the Moon

The bodies are practically duplicates of those used on Moon models. They are finished in lacquer, coming through at present in a gray green with red molding and red striping on the hood louvers.

In designing the Diana the Moon company had in mind the relationship between the new car and the Moon models in the matter of serviceability and maintenance. Consequently many of the units are interchangeable in both models.

The horsepower rating of the Diana is 28.8 hp. The actual brake horsepower at 2950 r.p.m. is 72 hp. and, since the standard sedan weighs about 3260 lb. ready for the road, it will be seen that the engine develops about 1 hp. for every 45 lb. of car weight. The speed range of the car is 0 to 77 m.p.h.

The eight will be made in six models, as follows: Roadster, $1,895; touring, $1,895; four-door standard sedan, $1,995; cabriolet roadster, $2,095; two-door sedan, $2,095; four-door de luxe sedan, $2,195.

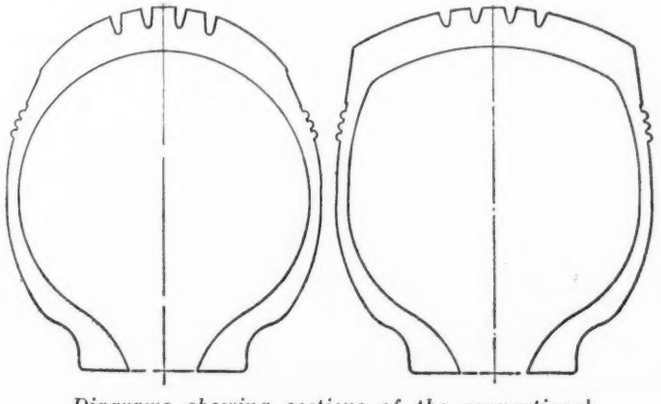
AFTER many years of experiment with all-steel dump bodies for trucks, the International Motor Co. has found that a steel body lined with heavy creosoted planks held in place by flat headed bolts has proved most satisfactory.

It is explained that bodies made entirely of steel are dented and distorted easily, especially when they are being loaded by means of overhead apparatus which sometimes drops heavy stones upon them from a considerable height. The hard wood lining, itself partly armored with steel, acts to some extent as a cushion which prevents the steel outer shell from becoming dented. When the wood lining becomes worn, as it does in time, it can be renewed easily without sacrificing the shell.

This form of construction is said to have proved so satisfactory that the design has been extended to express and other forms of steel body structures.

Miller Flat Shape Balloon Tire

A NEW design of cord balloon tire has been developed by the Miller Rubber Co., Akron, Ohio. As will be seen from the two sectional views, which show the conventional roundtread and the new flat shape tread tires respectively, the tread of the new design has a much larger radius. It is claimed for this tire that it is uniformly flexible over the whole section and that in consequence there is no concentration of bending stresses and no separation of plies. The aim is to give the tire the exact form which it will assume when inflated and put under load, the deformation under load neutralizing the deformation caused by inflation. One of the advantages claimed for this construction is that the tread wears down evenly, making all of the rubber in it count.



Diagrams showing sections of the conventional round tread and the new flat shape Miller balloon tire

Selling Motor Trucks in the South: the Demand and How to Meet It

Vast industrial expansion has created fertile market for commercial vehicles. Sales so far this year are 30 per cent above 1924. Oil and lumber companies and contractors best buyers.

By Harold F. Podhaski

IT has only been within the past few years—since the World War in fact—that the demand for motor trucks in the South has begun to draw attention to this section as a really worthwhile truck market—one of sufficient magnitude and promise to merit the investment of capital, time and effort in its further development.

Starting in about 1919 or 1920, this business began to experience a steady growth, and since that time motor truck sales in the Southern States have been showing a really remarkable increase from year to year. And yet, in spite of the fact that business in 1924 was 50 per cent better than it was in 1923, and during the first six months of 1925 was 30 to 35 per cent better than for the corresponding period in 1924, only the surface of the market has been scratched.

Unquestionably, during the next five years, the South is going to purchase many thousands of motor trucks. Industrially, the South is in the most prosperous condition it has ever known, and when industry prospers naturally motor truck business prospers along with it.

Particularly interesting of note is the remarkable development Southern industries are enjoying this year, which of course means a further expansion of the truck market. Figures which emanate from a thoroughly reliable source show that the amount of new industrial construction in the South this year has far exceeded, during the first six months of 1925, any similar period in the whole history of the district. And of still greater importance is the fact that the industries undergoing the greatest development are those which are the primary users of motor trucks in the South—the oil companies and the lumber trade. Then, the enormous amount of other new construction that is in progress directly affects the third most important motor truck market—the contractors and builders.

The Principal Buyers

While conditions will vary to same extent in the different States, considering the South as a whole the motor truck market may be classified as follows, the first four named in the order of their importance:

Oil companies
Lumber manufacturers
Contractors
General hauling (transfer and storage)
Building materials and supplies (separate from contractors)
Food products (wholesalers and producers)
Public utility companies
Bottling companies
Coal and ice companies

Of the above named, the oil companies, lumber manufacturers and contractors have been by far the biggest buyers during the past few years and doubtless will continue so, particularly of heavier trucks, say of two ton capacity and upward. Transfer and storage companies also are becoming more extensive buyers of heavier trucks, particularly within the past two years, but this market is not nearly as extensive as the first three named. The other markets named are of lesser importance so far, at least, as the Southern territory is concerned, but at the same time it is interesting to note that all these fields are using the motor truck on a much more extensive basis than they ever have before and that they offer a really profitable field for concerted effort.

In addition to the above there are, of course, several other truck markets in the South, which might be classed as miscellaneous. They are users of both light and heavy trucks, the nature of the field itself naturally suggesting the type of truck it would be most likely to require. Furthermore, the importance of these other fields will vary to a considerable degree in the different Southern States. Briefly, the most important of these may be listed as follows:

Government and State
Municipalities
Textile manufacturers
Chemical companies
Cooperage companies
Tobacco companies (Carolina and Virginia territory)
Fish companies (Seaboard or Gulf coast territory)
Promoters
Flour and feed companies
Furniture companies (manufacturers, retailers, wholesalers)
Plumbers and plumbing supply companies
Produce concerns
Retail stores (lighter trucks primarily)
Wholesale companies (both light and heavy trucks)

From figures compiled for the use of AUTOMOTIVE INDUSTRIES by some of the larger distributors and factory branches covering the Southern territory, an analysis by districts may be given as follows for trucks of 1½ tons capacity and upward:

Georgia: The lumber industry is by far the biggest buyer. Contractors are next in order, then oil companies and transfer and storage concerns.

Alabama: Lumber industries also lead here, with oil companies and contractors next in order. There is a fair volume of general industrial business also, due to Birmingham's importance as an iron and steel center.

North and South Carolina: Oil companies lead the field in these two States, with trucks for lumber hauling next. There is also a good demand from the textile in-

dustries, particularly in North Carolina, and from the tobacco industries.

Florida: Contracting companies are in the lead here. Oil companies and building material dealers are also good buyers. In Florida a wide diversification is noted, more so, perhaps, than in any other Southern State. Florida is doing an enormous amount of new building and will continue to build extensively for some time, so contracting companies will continue to offer a good market for motor trucks for an indefinite period.

East Tennesee: Contractors lead. There is also a wide diversification in this territory, but not as much as in Florida.

West Tennessee and Arkansas: Oil companies lead, with bottling companies and wholesale grocery concerns next in order.

Kentucky: Oil companies and contractors about the same. It is interesting to note, too, that in heavier trucks at least there are few sales outside these two fields.

Central Tennessee, Nashville District: Transfer and storage companies lead; oil companies and contractors fair. Grocery companies next in order because of Nashville's importance as a wholesale food center.

Louisiana and Mississippi: Oil companies lead. Building material and lumber concerns good buyers. Contractors good. Big diversification noted for raw material handling. Sugar companies also good buyers, and producers of fish products along the Gulf coast line.

Virginia and West Virginia: Public utilities lead here, such as telephone and power companies and the like. Lumber manufacturers fairly strong, and oil companies also good buyers. Building material firms and wholesale grocery concerns next in order. A fair diversification also is noted in this territory.

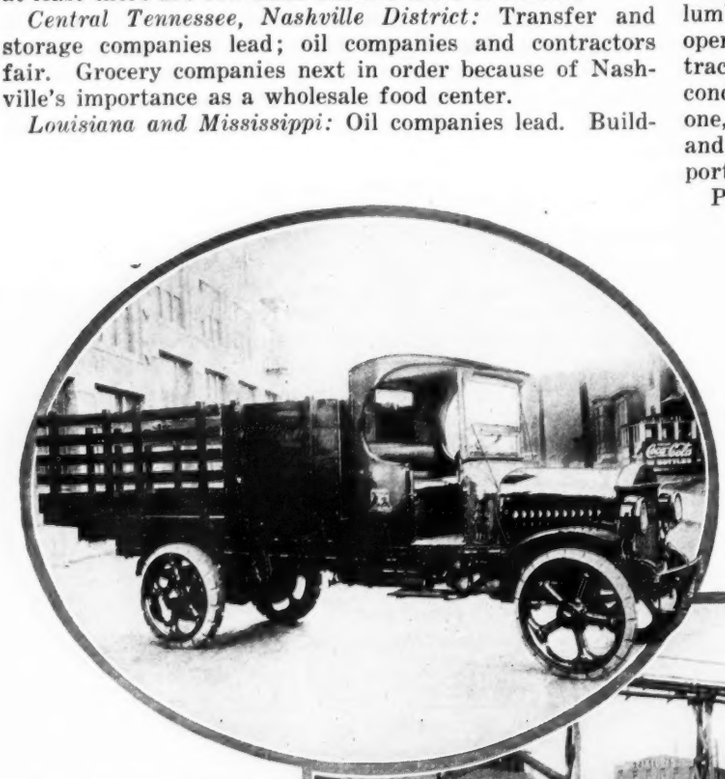
Once Sold, Stays Sold

The lumber industry five years ago was using but comparatively few motor trucks, whereas today it is using them in thousands. The market has now developed to a point where manufacturers no longer have to sell motor truck transportation, but rather the ability of a specific type or make of truck to fill the requirements. Performance is everything in this field. Motor trucks used by lumber industries are subjected to extreme wear and tear, operating over bad roads and into swampy, muddy timber tracts. But for any truck that can stand up under such conditions the market will be found a highly profitable one, for this industry still needs thousands of vehicles and will continue to be a good buyer of this mode of transportation for some years to come.

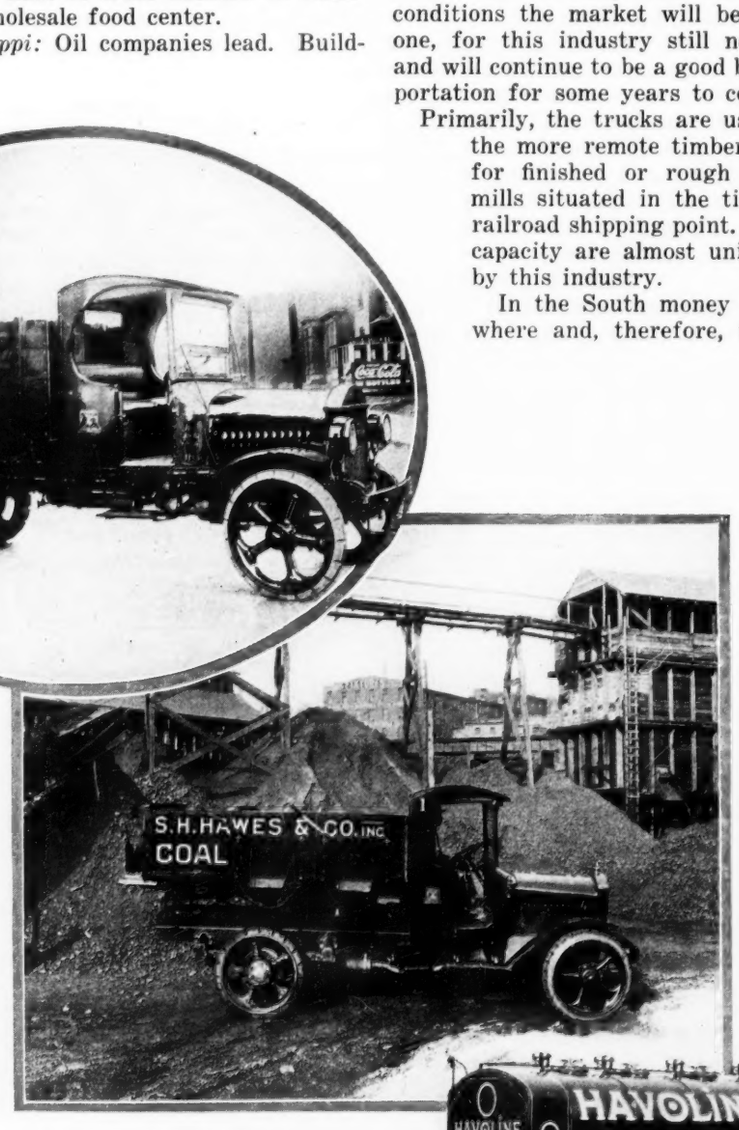
Primarily, the trucks are used for logging hauls from the more remote timber tracts to the sawmills, or for finished or rough lumber hauling from the mills situated in the timber tracts to the nearest railroad shipping point. Trucks of 2½ to 3½ tons' capacity are almost universally used in the South by this industry.

In the South money is not as plentiful as elsewhere and, therefore, the manufacturer must be ready to offer reasonable terms, particularly to the smaller lumber operators. And he must even be prepared to "nurse" such buyers along, as it were, in the event of depression hitting the lumber market, as so often happens, letting the truck virtually pay for itself.

The oil industry is controlled largely by a few very big corporations and, by specifications and they buy against



The bottling industry is a big factor in the business life of the South and a large user of trucks of the general type shown above



The center picture shows a truck operated from a Southern coal yard

Below—The oil industry leads as the heaviest user of trucks in the Southern market

quality, the situation is an exceedingly technical one. The manufacturer of motor trucks selling in this field is up against men who know all the details of that truck's engineering features about as well as he knows them himself, hence only thoroughly trained salesmen are likely to succeed. They are particular about operating cost and upkeep and, as the sales manager of one large truck concern in the South expressed it, "You can't possibly bull 'em." Men who buy the trucks for these oil companies have the information about operating costs at their finger tips and unless these costs are to their liking they will not buy.

But there are excellent opportunities in this market by reason of the fact that, once sold on the truck, these men stay sold on it. Let them be satisfied that you have a good product, one that will perform to their satisfaction, and they become steady buyers. Another feature worth mentioning is that they buy on a budget basis and, therefore, in quantities that make it well worth while. At the beginning of each year they figure on the number of trucks they are going to need next year, and they buy them in large numbers. So the market, once it has been opened, is highly profitable, and in dealing with such companies there need, of course, be no worry as to the matter of payments.

In the contracting field conditions prevail that are unlike those in any other market. Where the motor truck is considered as an investment in practically all other fields, here it is considered solely as an expense, with the possible exception of a few of the larger companies who have a steady need year in and year out for truck transportation.

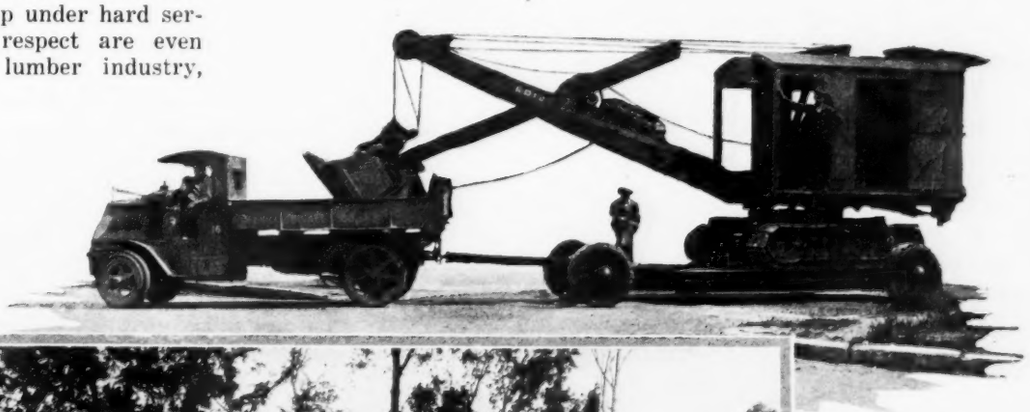
With most of the contracting companies, it is explained, the transportation need is only temporary. They have a certain job in hand that will take them a year or two, say, to complete. And everything they buy for the completion of that job is entered against it as an expense, including the motor trucks.

Like the lumber men, contractors want motor trucks that will stand up under hard service. Conditions in this respect are even more rigid than in the lumber industry, because when a contractor is working on a construction job he never wants to take his motor trucks off that job to lay them up in the shop for overhauling and repairs. Instead, he will ordinarily use the truck until it has practically worn itself out, in many cases keeping it in operation for as long as twenty-four hours a day as long as it will stand up under such usage. Therefore, when he has finished with his job his trucks have so little resale value that almost the entire amount he paid for the trucks it struck off as one of the costs against the job.

But this market is a highly profitable one to cultivate, particularly because of the enormous amount of new construction that is in progress and planned for the next two or three years in all parts of the South. It is nothing unusual for a contractor to buy as many as 20 to 30 dump trucks for use on a single large job, and from half a dozen to a dozen is a common buy on even smaller jobs.

The public utility market also is fast assuming real importance in the Southern States. In this market substantially the same conditions prevail as in the contracting market, with the exception that utility companies are better able to estimate their truck needs in advance, and plan to let them lay idle for a time for reconditioning. But when the truck is in use it is subjected to the hardest sort of service, equally as hard as in the contracting field or the lumber industry.

From 1919 to 1923 motor truck business in the Southern territory developed rather slowly, as it was then that the market was passing through its first stages of expansion. But sales created more sales, and the cumulative results of this gave the market considerable impetus during 1923, until by the end of that year it had assumed real importance. Then in 1924 came a better year by far than in 1923, with an increase estimated at approximately 50 per cent in the gross truck sales volume. Now the market begins to stand out as one of the most profitable in the country today. It is fully sold on the idea of motor truck transportation.



A typical contractor's outfit. Many contractors buy 30 to 40 trucks a year

The lumber industry is using thousands of heavy duty trucks in such service as that pictured here

National System of Motor Bus Regulation Proposed in England

Government Committee on Motor Construction and Use makes report. Safety of the public and adequacy of services are principal aims.

THE British Government Departmental Committee on Motor Construction and Use has just announced its recommendations on the subject of the licensing, inspection, regulation and construction of public service passenger vehicles of the motor bus or coach type seating eight or more passengers.

The committee has had for its three main objects the "safety of the public, their convenience, and the adequacy of the services provided for them." The essential requisites for any scheme of control are that no vehicle should be employed in the public service without first obtaining the proper license from the proper authority, and that conditions should attach to such a license to secure the observance of any regulations that may be deemed desirable. In the opinion of the committee, all local authorities' powers that may be in conflict with the scheme of control propounded in the report should be abrogated and a national scheme adopted.

The committee recommends that the license should be issued by the licensing authority for the district in which the vehicle is usually garaged or stationed and from which it usually operates. The licensing authorities in every case should secure the services of a member or members of the police force to act as bus and coach examiners. This would necessitate the officers concerned receiving suitable training in the duties they will have to perform, and it is thought that the training might be obtained by making use of the existing organizations of the London police and of some of the larger provincial city forces.

Constructional Requirements

Suggested constructional requirements are set out in detail and cover every component. The chief proposals are that the maximum length of the vehicle should not exceed 26 ft., and that the total weight, loaded and complete for service should not exceed 9 (long) tons, or the weight on one axle 5½ tons. For each passenger, as well as for the driver and conductor, 140 lb. will be allowed in calculating the total loaded weight. The overall width should not exceed 7½ ft. Nothing is said in the report about front wheel brakes, though it is stated that there should be at least two independent brakes, "the application of either of which shall be capable of causing the two rear wheels to be held so effectually as to prevent the wheels from revolving or have the same effect in stopping the vehicle as if the wheels were so held."

It is particularly recommended that vehicles with what is known as "left hand drive" should not be employed in the public services. This would bar Ford one-tonners and certain other American chassis now carrying bus bodies in England. No passengers should be permitted on the right hand side of the driver. Accidents have occurred in England through drivers being cramped by having passengers on both sides of them.

Where the vehicle is fitted with a permanent top and the entrance is not at the rear end, an emergency door opening outward should be provided behind and clear of the rear wheels. No doorway should be less than 18 in. wide and should open to the extent of 18 in. Seating accommodation across or in the gangways should be prohibited except in the case of vehicles without a permanent top. Suitable and approved appliances for extinguishing fire should be carried in such a position as to be readily available for use, and there must be adequate ventilation without the necessity of opening the main windows.

Method of Enforcement

The method of enforcement of regulations proposed by the committee includes the establishment by the Minister of Transport of a register of names of persons qualified and suitable to act as certifying officers. No public vehicle should be licensed until a certificate of fitness has been lodged with the licensing authority. The certificate should normally remain valid for an arbitrary period of five years, but during that period the licensing authority should be entitled to require a fresh certificate as and when they are advised that it is necessary. Apart from the inspection of vehicles prior to licensing, a vehicle examiner should be empowered to examine any vehicle at any time, and suspend the use of a vehicle he considers to be unfit for further service, either temporarily or definitely.

The committee recommends that applicants for licenses should satisfy the licensing authority either by the production of a policy of insurance in respect of the vehicle against all third-party risks, or by proving that they are in a position to meet such claims as may be made against them during the currency of the license.

The report also deals with the degree of control over public service vehicles which licensing authorities may exercise or attempt to exercise with a view to the regulation of traffic facilities. The undertaking by a licensee of an obligation to work a service at regular intervals must carry with it as compensation the right to work that service without unfair interruption, disturbance or competition, and it is proposed that the authority should have power to limit number of licenses issued in any district.

AN English inventor has patented an automatic switch for the ignition circuit which is operated by the suction in the inlet manifold. When the engine is cranked, the vacuum produced in the manifold draws a piston to the top of its cylinder, thereby closing the ignition circuit.

Just Among Ourselves

Coming to the Point in Convention Talks

WE'VE been a bit facetious lately about convention speeches and particularly about the roundabout methods often used to get under way and the length of time consumed before the speaker gets to the beginning of what he really has to say. Perhaps we are unduly critical in this matter, but we can't get away from the feeling that the real purpose of a convention speaker is to present as briefly as is consistent with clarity and thoroughness the information he has to impart. The convention or professional society speaker rarely is an orator and usually must depend on his information rather than his platform personality to hold his audience. He is performing a different function than that of the general public speaker.

Samples from a Recent Trade Meeting

PERHAPS a few samples will make clearer what we have on our mind. Here are the opening sentences from several addresses presented at a recent business convention which are typical of most other papers of similar nature:

1. "The first cast iron pipe of which we have any record is still in service after more than 250 years. This early pipe was cast horizontally, etc. . . ."

2. "In accepting your invitation to address you on the subject of arbitration in the lumber industry, it is assumed to be unnecessary to attempt to convince you that any method seeking the friendly adjustment of disputes is preferable to that which would result in the disruption of pleasant relations between business men, and which have been established after a long period of dealings, and frequently at considerable expense. . . ."

3 "I am supposed to talk on the use of the standard coal contract and while there is really not much more that can be said about the fairness of the contract as regards the seller, and the desirability as regards the buyer, the fact that it has not been universally adopted would go to prove that it needs more advertising among our own members."

4. "I am here today as a representative in a small way of the —— ——, which has been studying for the past nine years accounting problems having to do with the purchasing and storing of supplies for our industry. . . ."

5. "I am not going to try to psycho-analyze the purchasing agent as a type. . . ."

6 "When a manufacturer, trader or merchant is approached and asked 'How is business,' the common reply is 'Rotten'."

7. Notes on another address say "He opened his address by describing the natural beauty and geography of the city and county of San Francisco."

8. "The manufacture of malleable iron was originally motivated by a desire on the part of the early eighteenth century metallurgists to produce a metal having a ductility somewhat comparable with that of soft steel, and a fluidity, when molten, comparable with that of cast iron. . . ."

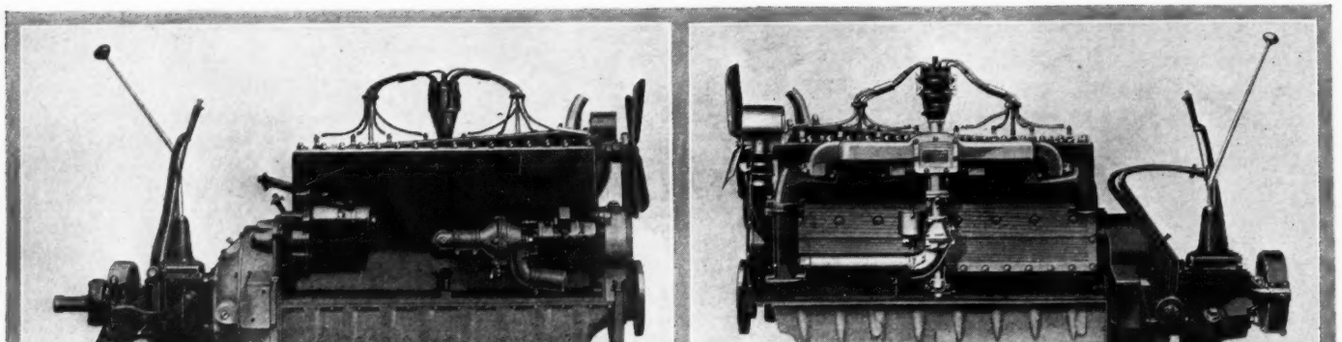
First and Last Paragraphs Most Important

HOW many of these sentences opening a story in a magazine or newspaper would lead you read further unless you felt it a business duty to continue? Some of them are more intriguing than others, but the general tendency either to begin with the creation of the world or to use a trite unimportant phrase often shows up. These same tendencies usually extend through the first few paragraphs and often through the first few pages of the typewritten manuscript. It is well to bear in mind that, despite prohibition and blue-laws, no law yet exists against putting a kick into the first paragraphs of a convention speech with the idea of taking hold of the auditor's attention and compelling his interest. Often this can best be done by coming immediately to the point and following in later with the data necessary to prove the conclusions.

More and Longer Conferences!

WE hear a lot about waste in advertising and marketing these days. Once in a while we get our hands on a concrete case that illustrates the general problem very clearly. Here's a pippin that came to us the other day. An advertising agency had been trying to get a decision from one of its big clients about a program which had been laid out. It took several months before the decision was made. Questioned as to what had happened in the meantime, one of the agency men said tersely: "In two months we have had 90 conferences in 17 cities involving a total of 104 men. And that's just one account." We hereby extend our gratitude to the fellow who kept count. He performed a real service, whoever he was. Maybe the concrete facts in a number of cases would startle more of us into action.

N. G. S.



Left—Starting motor, water pump and generator are mounted on the right side of Rickenbacker eight engine. Right—Valve side of engine showing manifolding

Many Parts of Vertical "8" Rickenbacker Now Interchangeable With "6"

Bore of larger engine increased from 3 to 3¼ in. Brakes, gas tank and fenders same on both lines. Prices on Eight reduced $200 to $600. Add new body styles.

RECENT price reductions ranging from $200 to $600 on the Rickenbacker vertical eight chassis are said by the manufacturer to be due to important economies effected through the redesigning of various major units so that they are interchangeable with those of the six-cylinder chassis, making for simpler manufacturing and service operations and increased production volume.

The most important change on the new Eight model is enlargement of the bore of the engine from 3 to 3¼ in., thus increasing the power output from 72 to 84 hp. With the bore of the Eight the same as the Six, all parts of the smaller engine are interchangeable with the Eight with the exception, of course, of such units as cylinder block, crankcase, crankshaft, etc. A larger and more effective water pump is now mounted on the larger engine, most of the parts of the former being interchangeable with those on the Six, while the oil pump and relief body interchange with the Six.

Among the engine parts which are interchangeable on the two models are: pistons, pins, connecting rods complete; timing chain, sprockets, chain case, cover; valves, springs, push rods, guides; main bearing caps, bearing shells, studs, distributor, drive gears, shafts, generator wiring assembly; parts of the oil lines, the flywheel housing and the bell housing. The clutch throwout is also common to both models.

Simplification of the four-wheel braking system has been made on the larger car so that the hook-up corresponds to that on the Six and all the operating parts can be used on both models. With the exception of the side rails, all frame parts are interchangeable on the two cars, as are the gasoline tanks and the fenders, the style of the larger car fenders being adopted for both models. A new heavier construction of the rear axle is employed, while the tire size has been increased from 33 by 5.77 to 33 by 6 on all body models on the eight-cylinder cars.

New bodies of more advanced design are mounted on the refined eight-cylinder chassis, which are priced by the Rickenbacker Motor Co. as follows: Sport phaeton, $1,995; coupe-roadster, $2,095; coach-brougham, $1,995; and the sedan, $2,195. A new roadster listing at $1,995 and a seven-passenger "de luxe" sedan at $2,470 will shortly be included. It will be seen that the open car now lists for the first time at the same price as the most popular closed model. In addition, a new line of

Parts That Are Interchangeable

THE Rickenbacker Motor Co. has taken an important step in the direction of standardization by so redesigning the Vertical "8" chassis as to make many major units interchangeable with those of the six cylinder model.

Here is a partial list of the parts which are now the same on both models:

Pistons, ring and pins; connecting rods complete; timing chains and sprockets; valves, springs, pushrods and guides; main bearing caps, bearing shells and studs; distributor drive gears, shafts and generator wiring assembly, water pump parts; oil pump, relief body and parts of oil lines; flywheel and bell housings; clutch throwout bearings; brake operating parts; gasoline tanks and fenders.

"de luxe" models having the highest grade of upholstery and selling at $125 more than the regular models are available on both Eight and Six chassis.

New Bodies on Six Line

A new line of bodies identical in design, coloring and upholstery to those on the Eight chassis are now mounted on the Six, which continues without any mechanical change other than a few minor refinements. The price of the Six phaeton has been advanced $100 to $1,495 and the sedan cut from $1,995 to $1,795. In addition to the roadster and coach-brougham, which remain unchanged in price, a new coupe-roadster at $1,695 is announced, while shortly a seven-passenger sedan will be included.

All body models on both chassis have a molding starting at the radiator and extending the entire way round the body, giving a pronounced double belt effect and enabling the two-tone exterior finish, which is used on all models, to be displayed to advantage.

With the exception of the open models, which are upholstered in long grain leather, the interior covering of all regular closed cars is in velvet velour, while the "de luxe" models are upholstered in silk faced mohair. The following color schemes are employed in two-tone Duco effects: Phaeton, Dublin gray; coach-brougham, Bambalina blue with black molding; sedan, green with gold stripes, and the roadster brown.

In the minor refinements made on the Six models, one inch has been added to the height of the radiator, while the thickness of the core has been increased from 1 11/16 to 2¼ in. The "coincidental lock" which has been standard equipment on the Eight is now applied to the Six also. This theft-proof device, which locks both steering post and ignition, consists of pin tumblers in the bracket which attaches the steering post to the cowlboard. In connection with the new fenders, which formerly were used on the Eight only, metal running boards have replaced the former wooden type, while their height from the road has been decreased by 1½ in. Tires, 33 by 6, similar to those on the Eight, are now fitted on both standard and "de luxe" special sedans. Wood wheels of natural finish are now standard equipment on all models on both chassis.

Following are the new and old prices on both the eight and six-cylinder lines:

Eight-Cylinder Line

	New	Old
Roadster	$1,995	
Sport phaeton	1,995	$2,195
Coach-brougham	1,995	2,395
Coupe-roadster	2,095	
Sedan—5-pass.	2,195	2,795
Sedan—7-pass.	2,470	

Six-Cylinder Line

Roadster	$1,595	$1,595
Phaeton	1,495	1,395
Coupe-Roadster	1,695	
Sedan—5-pass.	1,795	1,995
Sedan—7-pass.	2,070	
Coach-brougham	1,595	1,595

Through the standardization of the majority of parts used on the Six and Eight chassis, the company points out, the dealer will be able to carry a smaller inventory in the form of replacement parts for both Rickenbacker models and the customer will benefit correspondingly in having greater facility of servicing and the lower cost of parts.

Handbook on Metallurgy of Aluminum

AUTOMOTIVE engineers have every reason to be interested in the metallurgy of aluminum, for next to iron and steel it is the metal most extensively used in automobile construction. From some figures published by the National Automobile Chamber of Commerce it would appear that approximately one-half of the annual production of aluminum in this country goes into automobiles. In the aircraft industry it plays an even more important part. The rigid type of dirigible is built almost entirely of aluminum alloy and in the heavier-than-air class the tendency recently has been very strongly toward all-metal (that is, aluminum alloy) construction.

An encyclopedic handbook on The Metallurgy of Aluminum and Aluminum Alloys has been published recently by Henry Carey Baird & Co., the author being Robert J. Anderson, a well-known metallurgist who has long specialized on aluminum. Mr. Anderson was at one time metallurgical engineer of the Bureau of Mines, and was connected with the Bureau of Aircraft Production in the capacity of research metallurgist, hence his experience has well fitted him for the task of writing an authoritative work on the subject of aluminum.

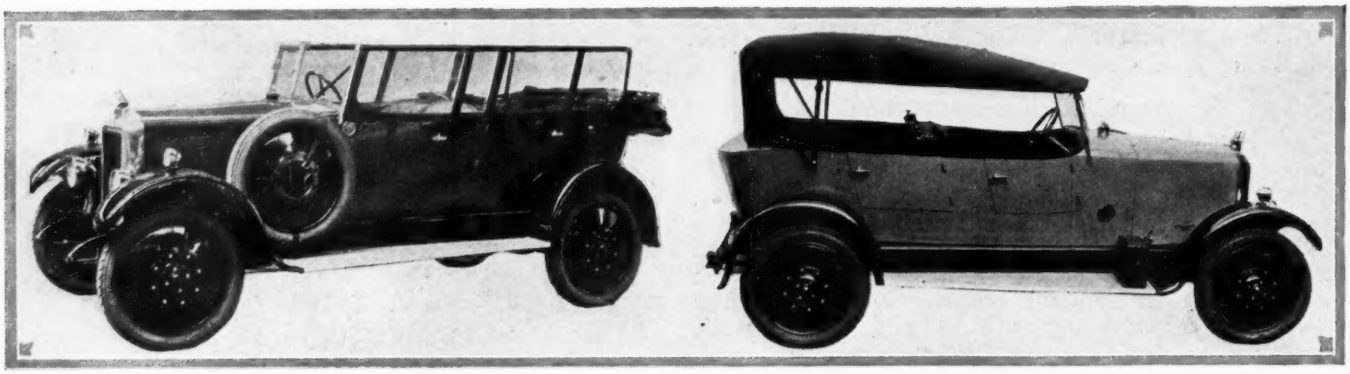
In an introductory chapter are given a brief history of the development of aluminum from the discovery of the metal by Wohler about a century ago up to the present day, and a survey of the status of the aluminum industry in the different producing countries. From this we learn that the United States produces about as much of the light metal annually as all other countries together. After the war there was quite a slump in the aluminum industry, the world production decreasing from 200,000 tons in 1918 to 76,000 tons in 1921, but since then production has been picking up rapidly and the record figure of 1918 has been nearly equalled again.

In the following chapter Mr. Anderson starts the story of the production of aluminum at the source, the bauxite mine, and in succeeding chapters he carries it through the reduction process and deals with the properties of the metal in the pure state and of its various alloys.

Considerable attention is given to the preparation of alloys for casting and working, and approved methods for preparing the principal alloys are described. Melting practice for aluminum and its light alloys is discussed on the basis of the author's investigations at the Bureau of Mines. In one chapter the production of secondary aluminum alloys from aluminiferous scrap is taken up.

The use of aluminum in the automobile industry is quite fully discussed, and the information given under this heading should prove quite helpful to foundrymen in producing castings. Casting losses and defects in castings are taken up and hints given as to methods of minimizing the number of wasters. An increasing number of parts is being made by die castings and permanent mold castings, and production of castings by these processes is given detailed consideration. The mechanical treatment of aluminum alloys for the production of sheets, forgings, bars and other finished and semi-finished manufactures is discussed.

While the theoretical aspects of problems connected with the metallurgy of aluminum are not neglected, the work is a thoroughly practical one, that meets the requirements of the engineer and the practicing metallurgist, and it can be recommended to those in need of information on the subject with which it deals. Very extensive bibliographical notes at the end of each chapter should prove a help to those who wish to make a research on any particular phase of the subject.



The new 14-hp. Armstrong-Siddeley with side screens in use without top. Note the angle of the screen frames, coinciding with that of front V-screen doors

14-hp. Armstrong-Siddeley with flexible top erected. Note the blunt "tail" in which storage accommodation for the side screens and small items of luggage is provided

Half-Elliptic Springs Used on New Armstrong-Siddeley "14"

Replace quarter-elliptics used heretofore. Body enlarged to compete with full-sized imported makes. Price raised £35.

By M. W. Bourdon

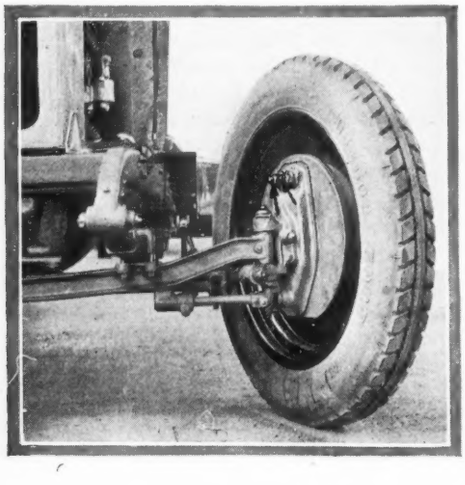
A BRITISH car which has continuously increased in popularity and output since its introduction in the summer of 1923 (when it was described in AUTOMOTIVE INDUSTRIES) is the four-cylinder 14 hp. Armstrong Siddeley. It was put forward to compete with full-sized imported cars, for although its engine was and remains in the new model but 112 cu. in. piston displacement, the body dimensions have been planned to exceed those of the average British light car of 12 and 14 hp.

A new model of this smallest of the range of Armstrong-Siddeley cars has just been introduced, following the adoption of a new engine for the largest model, the 30 hp. six-cylinder.

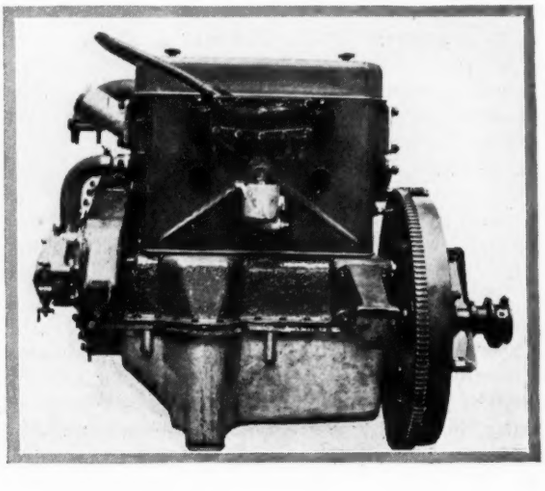
The general layout of the chassis of the "Fourteen" remains as hitherto, the engine being practically unaltered, with pushrod operated valves, detachable cylinder head and cylinder block formed as a unit with the upper half of the crankcase, the latter carrying the crankshaft in three bearings. The mounting of the three-speed gearset as a unit with the torque tube is continued, though the gearbox has been redesigned to enable wider gears to be provided.

One of the principal alterations in the chassis consists of the adoption of semi-elliptic springs front and rear, in place of quarter-elliptics all round. The new springs have rebound plates above the main leaves, and two anti-deflector clips are fitted to hold the rear half of the leaves together when the car is being braked.

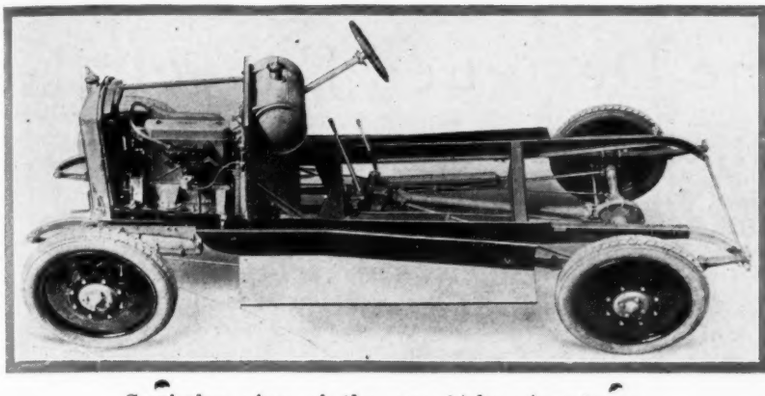
Front-wheel brakes of the Rubery type are standard, these being operated by pedal or lever in conjunction with the rear wheel brakes. Both front and rear shoes are of the internal type, but are notable in having eccentric anchor pins which enable shoe adjustment to be made by means of extensions of the pins projecting through the



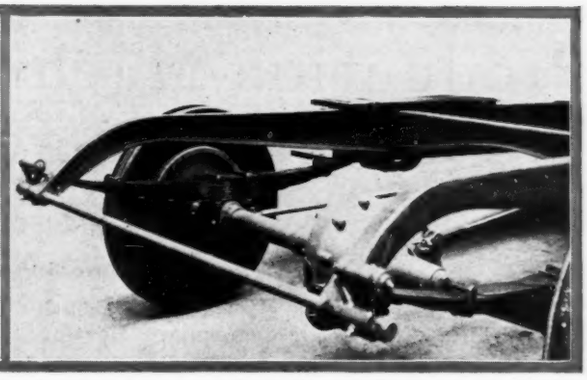
The Rubery type front wheel brake. In this rendering each shoe has an eccentric anchor pin for adjustment, the exterior ends and locking nuts of the pins being indicated by the arrows. Service adjustments are on the side of the pull-rods



Engine of 14-hp. Armstrong-Siddeley. View shows exhaust jacket of induction manifold with by-pass pipe of large diameter leading from exhaust branch on other side



Semi-plan view of the new 14-hp. Armstrong-Siddeley chassis



Rear springs of new 14-hp. Armstrong-Siddeley with ante-rebound plates above the main leaf

brake casing. Each shoe has its own anchor pin and can thus be adjusted individually, if necessary, while service adjustments are afforded in addition at the ends of the pullrods.

In the original model the rear brakes were operated by cables. These, however, have been displaced and rods only are used. The brake drums have been stiffened and the shoes widened in comparison with those of the original rear brakes.

The wheelbase of the car has been increased from 111 to 114 in., while other minor variations include considerably greater clearance, vertically and laterally, between the tires, the fenders and bodywork, so that even when chains are employed there is plenty of clearance. The fuel tank has been increased in capacity from 6 to 8 Imperial gallons, and an extension of the under-pan now runs back behind the flywheel.

Although the general design of the plate clutch remains as hitherto, an oil catcher and thrower has been added, so that no matter how much the pilot bearing is over-lubricated the excess is thrown outside the clutch and cannot reach the disks. Incidentally, the clutch-operating levers have been strengthened.

Manifold Heating Jacket

A modification in the engine is the provision of a better heating jacket for the induction manifold, a by-pass pipe of approximately 1 in. diameter running forward and around the engine from the exhaust manifold on the opposite (right hand) side. The heating jacket has a side plate held by studs and nuts to enable the interior to be cleaned out occasionally.

Among engine features which have not been varied are the chain drive for the camshaft, aluminum pistons, hollow crankshaft lubrication, pump water circulation, gravity fuel and a fan integral with the flywheel. The bore and stroke also remain the same, viz., 3 x 4 in. The final drive is by spiral bevel, the gear ratios being: first, 17.5 to 1; second, 8.63; top, 4.7; reverse, 22.25.

The new open body is notable in having "half-decked" top edges finished in mahogany. The decking not only caps the sides but also finishes off the backs and the fronts of the rear seats and the top of the instrument board behind the front screen.

Another innovation, so far as British practice is concerned, is the sloping of the side panels and door openings, with an angle corresponding with that of the driving screen, which is now of the V-fronted type with the top panel in front of the driver adjustable. The metal-framed detachable side panels of the folding top also slope to conform with the lines of the body and screen, their narrow frames being sunk in rattle-proof sockets which lock them rigidly and enable them to be used independently of the top. When not in use they are stored behind the rear seat upholstery.

Still another special feature lies in the fact that, while the framing of the front seat is a fixture, the driver's seat is adjustable fore and aft, while behind the front passenger's seat is a compartment for storing small items of personal luggage, additional space for this purpose being located behind the rear seat and in the door pockets.

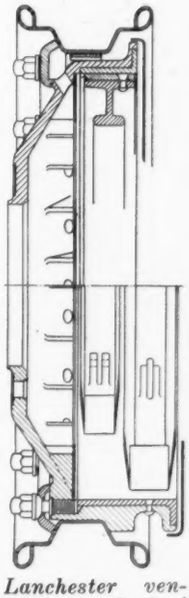
Folding Rear Windshield

A folding rear wind screen is standard and the normal equipment also includes a fuel gage, spring gaiters, windshield wiper, speedometer and clock, while either 29 x 4.95 in. balloon tires or 765 x 105 mm. high pressure tires are available at option on detachable disk wheels.

The price of the new model has been increased from £360 to £395, though with its four-wheel braking and other improvements and additions it represents even better value than the superseded type.

A few general dimensions are as follows: Track 56 in., overall length 156 in., overall width 66 in., ground clearance 10 in. The fuel consumption is claimed to be from 26 to 28 miles per Imperial gallon, and the speed range on top gear from 5 to 55 m.p.h.

THE introduction of the balloon tire has brought about a number of changes in wheel design. Not only has the diameter of the wheels been cut down considerably, but on the heavier cars at least the brake drums have come very close to the wheel rims and in a number of instances, particularly with disc wheels, it has been found necessary to make special provisions to retard the heat flow from the brake drums to the wheel rims and the tires, which latter are injured by exposure to excessive temperatures.



Lanchester ventilated road wheel

An example of means for protecting the tires against heat from the brakes is furnished by a wheel design by Lanchester, on which a patent has been issued in England. From the accompanying drawing it will be seen that the wheel carries the drums for both the service and the emergency brake and that the drums are of nearly the same diameter as the wheel rims. The disc A is provided with an overhanging flange B, the inner surface of which serves as the brake surface with a metal lining C. Passages for the circulation of cooling air are provided between the flange B and the tire rim.

Production Machine Designed Especially for Differential Housings

Pratt & Whitney Co. develops single purpose tool for boring and reaming holes which carry pinions in housings.

THE Pratt & Whitney Company of Hartford, Conn., has recently developed a special single purpose machine for boring and reaming the three holes which carry the pinions in automobile differential housings. This machine is suitable for several sizes of work and constitutes an interesting solution of the difficult problem of obtaining rapid production on this operation. It was specially developed for the International Motor Co., New Brunswick, N. J.

In general the machine consists of a large, angular bed which mounts two separate boring head units, each having its own motor drive. These two units are mounted at an angle of 120 deg. with each other, with the work indexing fixture at the apex of the angle. In this manner the machine maintains the correct boring angle between the two spindles, and the operation is a continuous one, as one spindle is boring while the other is reaming. The bed of the machine is made particularly massive, to avoid vibration, and forms a rigid foundation so that the machine will do the very accurate work required for these gear mountings.

Figs. 1 and 2 are front and rear views of the machine, and a very good idea of the construction can be obtained from these photographs. The two heads are practically identical except that they are left and right hand, respectively. Fig. 3 shows the details of the left hand (boring) head. A long spindle quill is mounted in very heavy bearings and a rack on the under side of the quill engages the hand wheel pinion for moving the spindle quill by hand. A 1½ hp. 1150 r.p.m. motor is mounted on top of the head, and is geared directly to the spindle and to the power feed driving shaft as shown in Fig. 3. The power feed is connected to the spindle through a Johnson friction clutch operated by a convenient lever just behind the large handwheel. In this manner the operator's position is a very convenient one. The boring bar is mounted in the usual manner in the spindle nose, which has a No. 4 Morse taper, The entire mechanism is a particularly rigid one, and quite simple.

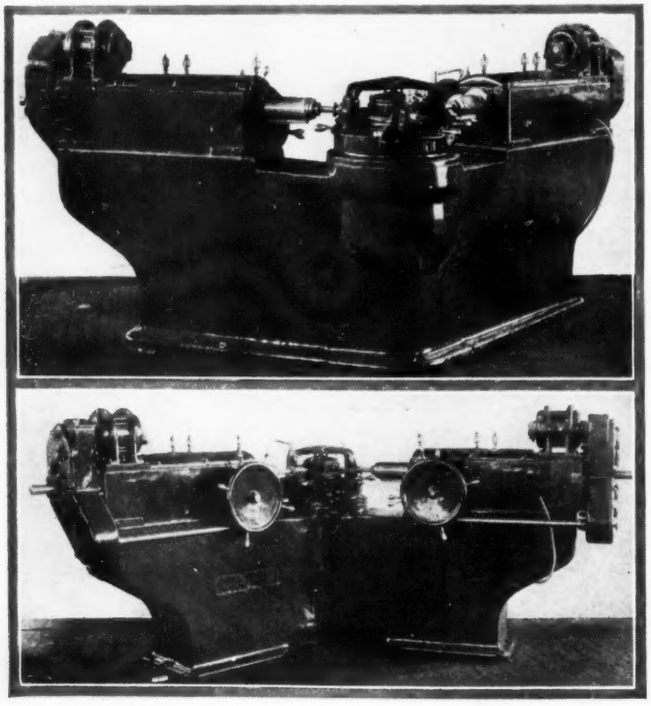


Fig. 1—Front view of Pratt & Whitney differential housing boring machine
Fig. 2—Rear view of Pratt & Whitney boring and reaming machine

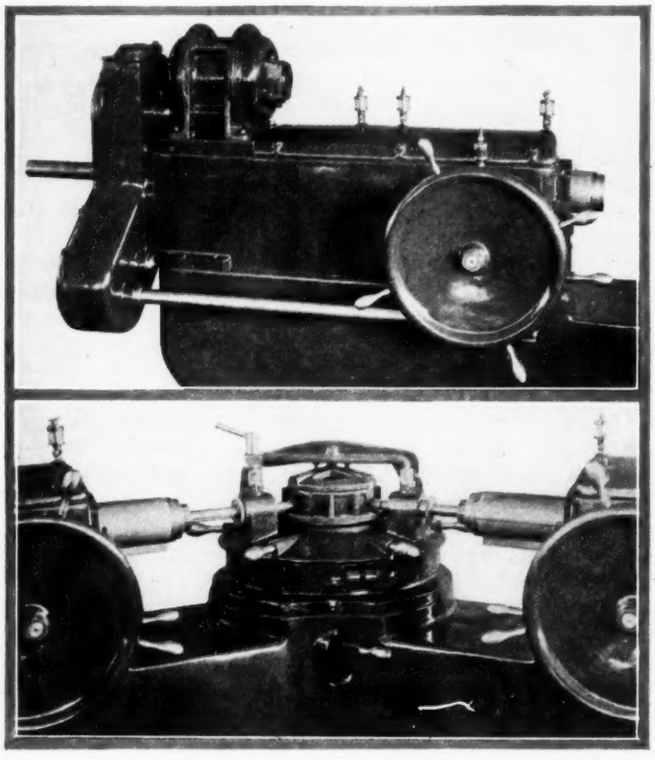


Fig. 3—Detail view of one of the heads of the machine
Fig. 4—Detail view of the indexing device

The two heads are geared differently, as the left hand one is used for boring and the right hand one for reaming. The left hand head is geared to give a boring speed of 350 with a power feed of .010 in. per revolution of the spindle. The right hand head has a reaming speed of 150 with a feed of .060 in. per revolution of the spindle. These speeds and feeds can be altered if desired by substituting different gears in the two gear boxes. The oiling of the heads is accomplished entirely through sight feed oil cups, with the exception of the gear boxes, which are lubricated from a large reservoir in the top of each.

Fig. 4 shows a view of the indexing fixture which holds the work. The work casting is held in place by an overarm which clamps down on top with a convenient binder. The

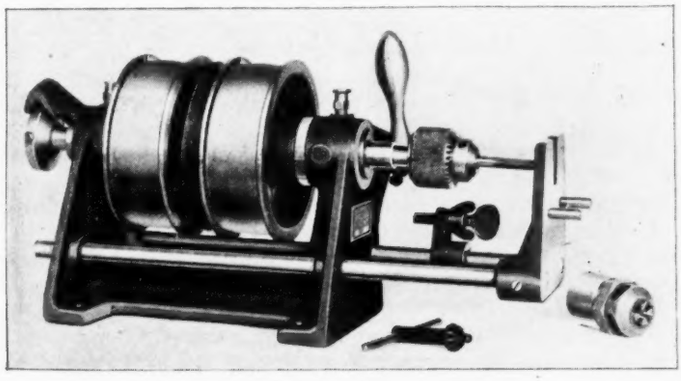
three hardened steel shoes which show on the under side of the holding plate are removable, and various sets are provided for the different sizes of castings to be bored. These shoes and the adapter plates are the only changes necessary to accommodate the various sizes of work.

The table is indexed by hand and is provided with a locating pin operated by the lever projecting through the bed itself. A binder, which consists of a split sleeve extending all the way around the table, holds it tightly in position during boring. This binder has a taper inside surface which forces the table down tightly against the bed, insuring the work being held accurately in place against the locating surface. Floating bushings on the boring and reaming bars fit into the guide holes on the upper surface of the table and form supports for the bars. These same holes also provide a means for locating the work by using the taper locating pin shown. This pin is tapered to accommodate holes from ¾ in. to 1⅛ in. in diameter, which is the range of sizes for which the present machine is made. This makes a particularly fast means of locating the work, by the upper and lower machined surfaces and the previously drilled holes. The table indexing ways are lubricated by rolls and reservoirs in the same manner as a planer table.

New Tapping Machines and a Drill Speeder

A LINE of bench tapping machines has been developed by the Bench Machine Tool Company of Philadelphia. The No. 2 machine illustrated, which is of the friction cone type, has a range of from 3/16 in. (No. 10 machine screw tap) to ⅜ in. in cast iron and to 5/16 in. in steel. Tappings speeds of 350 to 1000 r.p.m. are obtained, depending on the material, tap size and depth of hole. The reversing speed of the tap is usaully twice the tapping speed.

This machine is also furnished with an adapter and a Greenfield "Acorn" die for use in threading. With the addition of a small holding fixture to the face plate, studs and similar work are threaded with facility and speed. The adapter is taper bored to fit the spindle and is interchangeable with the Jacobs chuck, so that the machine may be changed from a tapping to a threading machine in a few minutes.

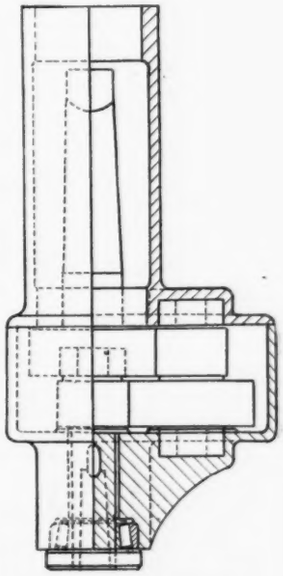


"Bench" No. 2 tapping machine

Another feature of interest is the use of this machine for drilling small parts, or producing shouldered studs by the hollow mill process. A feed attachment is furnished, providing the necessary pressure without effort on the part of the operator.

The No. 1 tapper is a smaller size very similar to the machine described above, except for use with taps ranging from No. 3 to No. 10. It is, therefore, equipped with flat friction disks so as to increase its sensitiveness and prevent tap breakage.

A DRILL speeder which permits the use of large radial drills on smaller work has been brought out by the Hoefer Mfg. Co. of Freeport, Ill. It consists of a housing of suitable dimensions, with a nose and driver to fit the machine on which it is to be used, whether this be a No. 4, 5, or 6 Morse taper. The speeder spindle is fitted with a No. 4 Morse taper, which secures sufficient range for a 1¼ in. drill. The gears are of the stub-tooth form, 6-8 pitch, of 2 in. width of face; they are made integral with the spindles, the whole piece being hardened and the spindles ground. Radial bearing load is taken on Hyatt and thrust load on Timken roller bearings. The device is quite compact and can be attached or removed in a few minutes, it is claimed. In spite of its rigidity and capacity the speeder is very compact, measuring less than 12 inches through its largest cross section.



Hoefer drill speeder

Ochrome Alloy Valves

POPPET valves for internal combustion engines made from a non-ferrous alloy are manufactured by the Ochrome Valve Co., Shelton, Conn. The material used for these valves is a cupro-nickel-chromium alloy which not only has very good physical properties at normal temperatures but is highly resistant to the effects of high temperatures.

The forgings for these valves are made by the Curtiss Bay Copper & Iron Works, a subsidiary of the U. S. Industrial Alcohol Co., and the Ochrome Valve Co. finishes the forgings and markets the product. These valves, of course, are particularly suited for use in engines of the high duty type, in which the conditions of valve operation are particularly severe. They are intermediary in price between alloy steel valves and nickel chromium valves. We are informed that tests extending over a peroid of approximately two years have developed no case of breakage, burning or warping.

At the present time the Ochrome Valve Co. is furnishing these valves to three manufacturers of marine engines, who use them as standard equipment. The valves are being made both for original equipment and for replacement purposes. One of the advantages of the valves is that, since they have no iron in them, they will not rust and are therefore not subject to deterioration in case the engine is laid up for a long period.

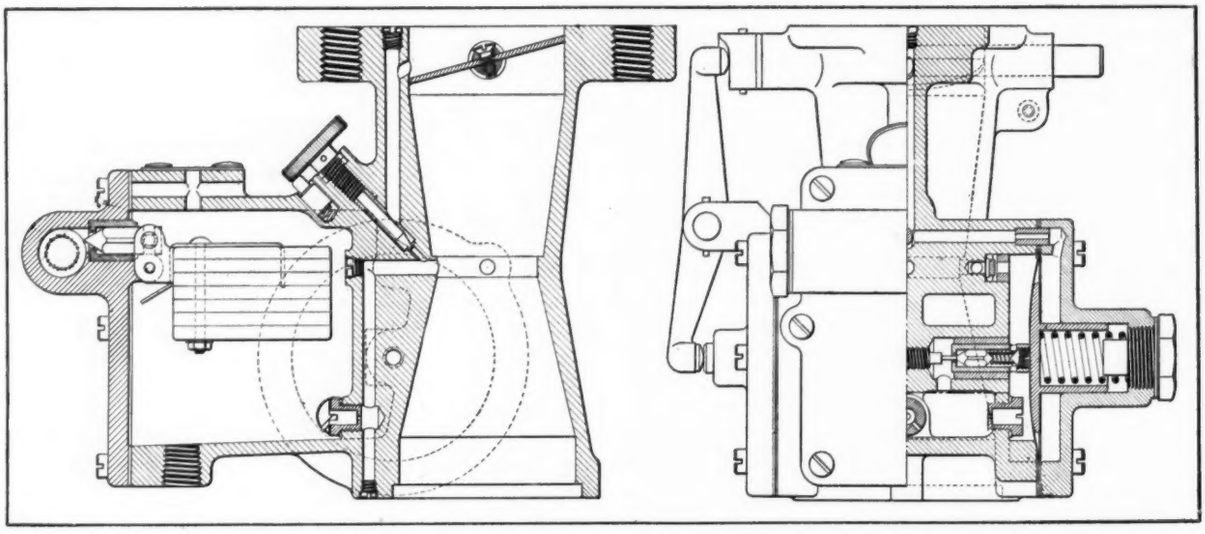


Fig. 1—The Stewart-Warner carbureter in section, showing the arrangement of parts and passages controlling both the steady running mixture proportion and the accelerating fuel

New Stewart-Warner Carbureter Has Special Control Features

Three fuel metering orifices provided. Only idling jet is adjustable and enriches mixture at low speeds. Diaphragm under influence of vacuum controls the accelerating supply.

SEVERAL innovations in mixture proportion control and in control of accelerating fuel are embodied in the new Stewart-Warner carbureter, designed and developed by P. S. Tice of the Stewart-Warner Speedometer Corp., Chicago. The departures from conventional practice in this carbureter have grown largely out of a series of investigations the general results of which will be presented in an article by Mr. Tice, to be published in next week's issue of AUTOMOTIVE INDUSTRIES.

As will be seen from the sectional views of Fig. 1, the single air passage is constructed to form a throat into which the fuel is discharged after passing through metering plugs or jets. All three jets are submerged and discharged at the periphery of the throat, thus keeping the throat clear of jets or standpipes and their supporting bosses. The absence of these latter contributes to a high pressure recovery or small drop across the carbureter.

Particular attention has been given in the design of this carbureter to securing fine spraying and consequent wide diffusion and high entrainment of fuel. This result is accomplished by the operation of the idling by-pass directly upon the main fuel discharge passage, by the peripheral communication of the fuel outlets with the throat, and by the jog or step in the throat just above the fuel outlets. This latter is of particular value at wide open throttle at very low engine speeds.

The fundamental operating principle of this carbureter is such that the mixture proportion is constant or nearly so, and superimposed upon this general characteristic are design features that cause a richening at both ends of the load range. From about four-tenths down to zero load the idling by-pass increasingly enriches the mixture, the amount of the enrichment being controlled by a spring-latched needle valve, set at an angle just above the float chamber. The manner in which it brings this about will be clear from its location and its point of communication with the fuel passage supplied by the larger of the two fixed jets.

The curves of Fig. 2 show in detail the effect upon the mixture ratio of varying the setting of the idling by-pass needle. Since the flow of both air and fuel through this by-pass results from the difference in pressure between the throat and the region in the intake passage above the throttle, the extent of its influence at any setting depends upon the intake pressure [illegible] rather than on the quantity of [illegible] throat.

Flexible Diaphragm

The second and smaller of the two fixed jets communicates with the throat by way of a chamber, one wall of which is a flexible diaphragm. The outer side of the diaphragm is pressed upon by a plunger backed up by a spring, and is subjected to the pressures in the intake above the throttle valve. As this pressure changes the position of the diaphragm changes, thus altering the volume of the chamber through which the fuel passes on its way to the throat. Since the entrance to this chamber is by way of a small metering orifice and the outlet is large and free, inward motion of the diaphragm following a rise in intake pressure causes the ejection into the throat, at a high rate, of fuel in excess of that normally flowing, the amount of such fuel being proportional to the motion of the diaphragm, which in turn is related to the change in intake pressure. To keep the diaphragm chamber filled with liquid and thus enable it to repeat such discharge no matter how rapidly or frequently it is

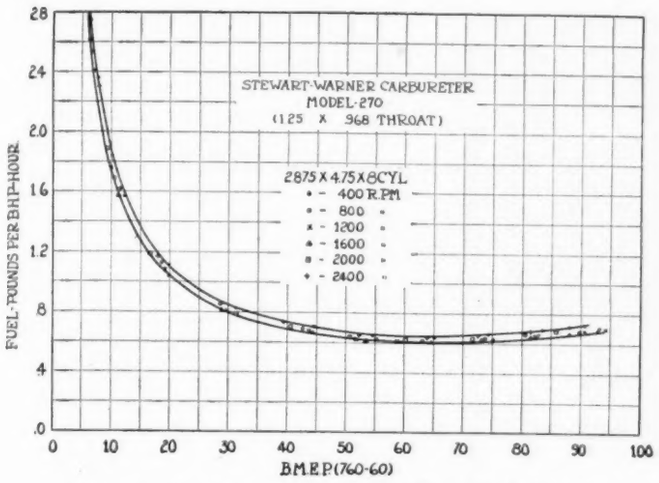


Fig. 2—How the setting of the idling adjustment changes the mixture proportion

called upon to do so, a free check of flapper form is built into its outlet passage to prevent the entrance of air from the throat on the "out" stroke of the diaphragm following a reduction in the intake pressure.

The third jet is in the form of a floating plug in the end of which is a hole normally closed by a small triangular spring-seated valve having an integral spigot or pin projecting through the hole. As the diaphragm just discussed is pushed inwardly by its spring plunger following a rise in the pressure in the intake, it in turn pushes the plug containing the valve ahead of it. Throughout the greater part of the diaphragm motion nothing is changed with respect to the plug and its valve, but the latter part of the motion presses the spigot against a stop and progressively opens the valve. This increases the total area of fuel jet passage between float chamber and throat and enriches the mixture correspondingly.

Since the diaphragm position and therefore the extent of opening of the jet in the floating plug, is a function of the intake pressure, it is clear that the enrichment thus brought about is also dependent upon the pressure and therefore upon the relative air supply or relative load.

By these means the steady running mixture proportions are made to approach the optimum very closely throughout the load range at all speeds, and to satisfy closely the peculiarities of any given engine. A typical set or family of mixture ratio curves obtained with a service setting of this carbureter on an engine of approximately 250 cu. in. displacement is shown in Fig. 3, the corresponding fuel consumptions being shown in Fig. 4.

Operation of the carbureter is stable throughout its ranges, and there are no transitions or changes of regime. The jets are proportioned so that there is an almost zero temperature (or viscosity) coefficient, making the metering almost completely independent of temperature changes. The entire setting of the carbureter is fixed by the specifications, with the single exception of the idling mixture, which is left adjustable as noted above. Adjustment of this latter causes no departure from the general characteristic shape of metering curve, but only modifies the extent of its droop at the minimum load end. Fig. 2. The third or auxiliary jet, carried in the floating plug, is fixed as to the extent of its opening by the size of hole and of the spigot projecting through that hole, the stop against which it abuts being in all cases set to give the full area of opening with the diaphragm in its farthest "in" position. While the stop position is adjustable it is made so solely for convenience in manufacture. The whole of the diaphragm mechanism is remarkably stable, it is said, being capable of many hundred thousand cycles without shifting of its limiting positions and without alteration of its deflections as related to the pressures applied to it.

Returning to the control of the accelerating fuel, the diaphragm described above is ordinarily utilized to handle about one-half of the total quantity of fuel needed for full acceleration, depending upon the engine to which it is applied. The rate at which this portion of the accelerating fuel is supplied closely approximates the rate of change of pressure in the intake. The remainder of the total accelerating fuel is applied by means of a positively actuated diaphragm pump arranged on the side of the carbureter opposite the pressure actuated diaphragm. A rocker lever transmits motion from a cam to the diaphragm through a plunger, and the diaphragm is returned by an opposing spring-backed plunger when the

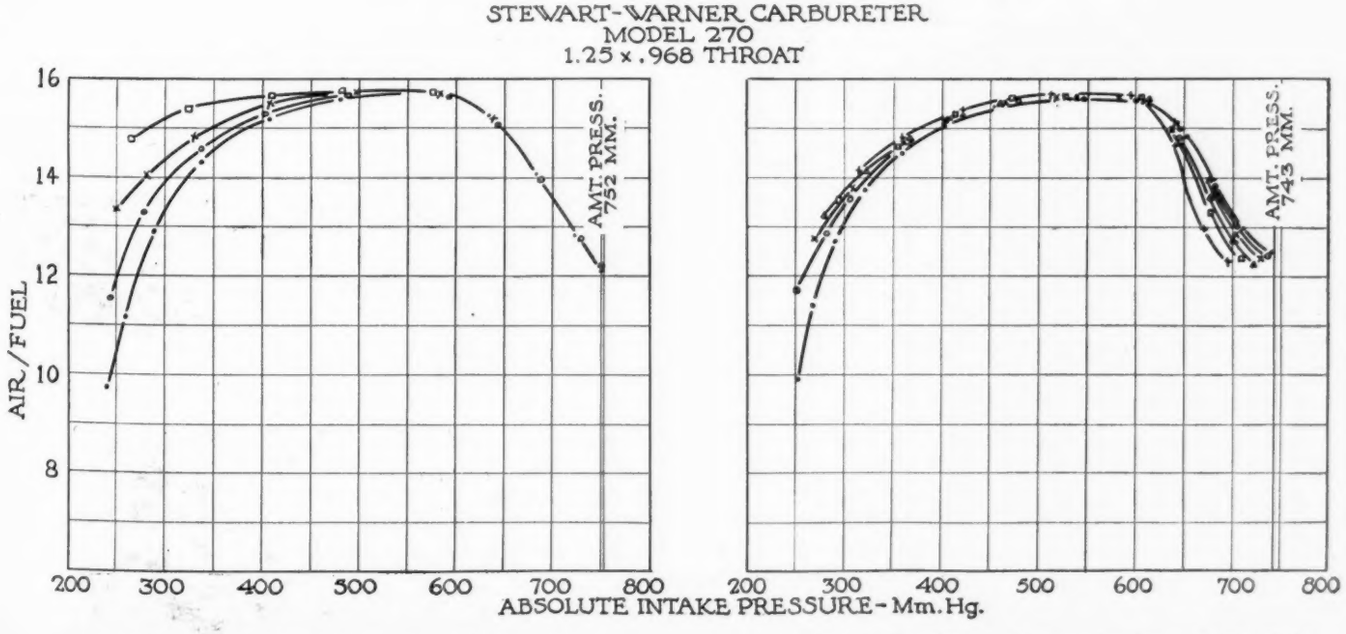


Fig. 3—A family of mixture proportion curves on a fixed service setting, covering a wide speed range and the whole load range at each speed

Fig. 4—Specific fuel consumptions obtained in the set of runs giving the mixture proportions of Fig. 3

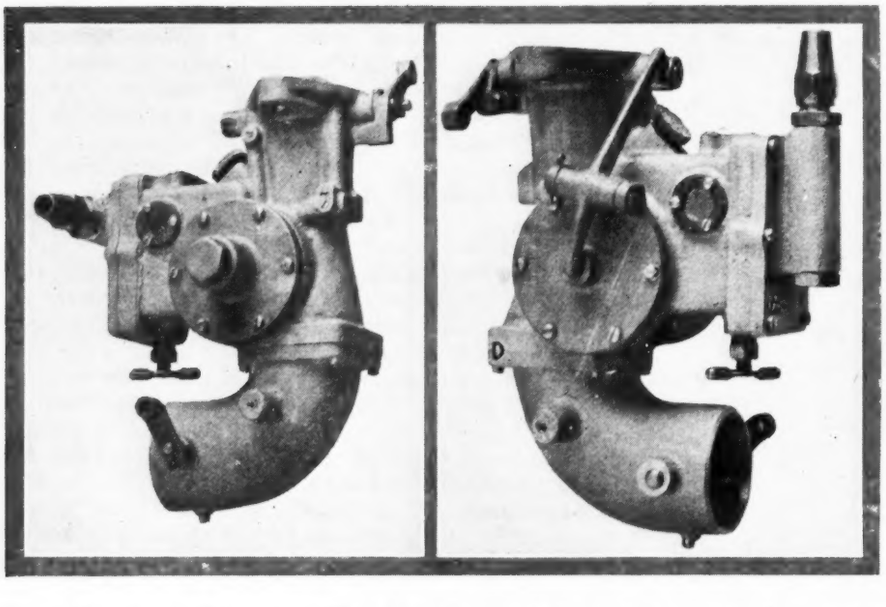


Fig. 5—Exterior views of the Stewart-Warner carbureter, showing the oppositely located pressure and mechanically actuated diaphragms the float chamber windows, and the alternative fuel strainer mountings

cam releases it (Fig. 5). The cam is mounted on the throttle spindle and engages the lever to move the diaphragm only after the spindle has been rotated to open the throttle through 15 to 18 deg. of its possible 75 deg. total motion. Thus, when operating at usual engine speeds, the mechanical pump does not come into action until from about 80 to 65 per cent of the relative air is flowing. The accelerating fuel control system in both its pressure and its mechanically actuated portions, is very flexible and is capable of close fitting to the acceleration requirements for maximum responsiveness in any given case.

Structually the whole mechanism is simple and rugged. The diaphragms are of a hard rolled alloy that has been proven to have physical qualities that make it capable of long life in this service. None of the springs are delicate or sensitive as to strength; and none of the passages are so small or so located that they are liable to obstruction.

The float mechanism in its entirety is mounted by six machine screws; and fuel can reach the float valve only after passing through a screen of 100 mesh having a useful area of two square inches. This screen is made up as a sleeve through which the fuel passes from the inside to the outside; and it thus retains all accumulated dirt which is withdrawn from the carbureter when the screen mounting is unscrewed. This latter is accomplished without disconnecting the fuel line.

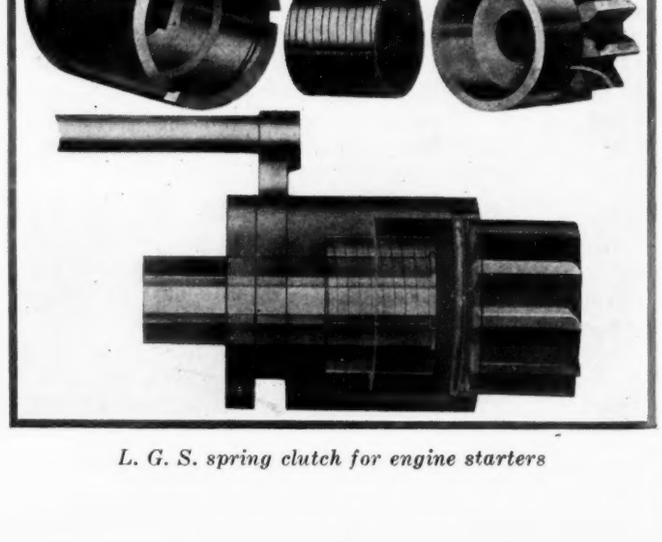
The objectives aimed at in the design of this carbureter are stated to be: Maintenance of the mixture proportion at the most economical value, except when the maximum output is demanded; and the supplying of accelerating fuel in such a manner and in such quantity as to give maximum responsiveness in all accelerations, large or small.

Drive for Engine Starters Has Only Three Major Parts

A NOVEL drive for engine starters, known as the L. G. S. type, has been developed by the American Spring Clutch Co. of Indianapolis, Ind. It consists of only three major parts, viz., a driving cup, which is keyed to the motor shaft; the pinion with a driven cup, which is normally free upon the shaft, and a helical steel spring which acts as a clutch member. The driving cup is bored out to two diameters and the pinion cup enters the larger bore. By means of a yoke and rod the starter pinion can be moved into and out of mesh with the flywheel gear.

There is a certain amount of friction between the ends of the helical spring and the heads of the two cups, and if there is a relative motion between the driving and driven members in one direction the spring will unwind and expand, thereby gripping the cylindrical surfaces of the two cups, whereas when the relative motion is in the other direction the spring will wind up, contract and disengage.

It is claimed impossible for the starter gears to lock.



L. G. S. spring clutch for engine starters

SWEDEN imported 11,636 automobiles during 1924, as compared with 11,726 in 1923.